



**WARNING:**

**Improper installation, setup, modification, operation or maintenance of the heating system can cause personal injury and property damage.**

**Follow each appliances' instructions precisely.**

**For assistance or further information, contact a trained and certified installer, service provider, or the gas supply company.**

**In Massachusetts, the boiler must be installed by a licensed plumber or gas fitter.**

**Application drawings in this manual are conceptual only and do not purport to address all design, installation, code, or safety considerations.**

**The diagrams in this manual are for reference use by code officials, designers and licensed installers. It is expected that installers have adequate knowledge of national and local codes, as well as accepted industry practices, and are trained on equipment, procedures, and applications involved. Drawings are not to scale.**

**Refer to the boiler, control and module installer manuals for additional detailed information!**

## Gas Condensing Boiler

# Bosch Greenstar™

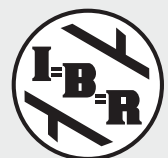
100, 151 Combi Boiler

57, 100, 131, 151 Heating Boiler



**BOSCH**

## Applications Manual





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# 1 Information about the appliance

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## 1.1 Boiler types and sizes



### Greenstar Heating boilers

- ▶ Greenstar 57: ZBR 16-3, 54,600btu (16kW) output
- ▶ Greenstar 100: ZBR 28-3, 95,500btu (28kW) output
- ▶ Greenstar 131: ZBR 35-3, 119,400btu (35kW) output
- ▶ Greenstar 151: ZBR 42-3, 143,000btu (42kW) output

### Greenstar Combi-boilers

- ▶ Greenstar Combi 100: ZWB 28-3, 95,500btu (28kW) output
- ▶ Greenstar Combi 151: ZWB 42-3, 143,000btu (42kW) output

## 1.2 FW200 Boiler Energy Management System

- ▶ The Boiler Energy Management System includes the FW200 user programming interface with integrated outdoor reset control.
- ▶ In connection with the IPM2 module the FW200 offers an outdoor reset control for two heating zones and DHW generation with time programs:
  - Central heating  : Six weekly heating programs with six programmable switch points per day (one program is active).
  - DHW  : weekly DHW program with six switch points per day.
  - DHW Recirculation pump program.
- ▶ Options:
  - Remote control and room sensor FB100 provides status information and a programming interface in each zone.
  - Module ISM2 for solar DHW heating and solar space heating support.
- ▶ Programs and settings are stored in a permanent memory and remain even during power outages.
- ▶ Installation options:
  - In the boiler
  - Wall-mounted as a remote room sensor

### Scope of delivery

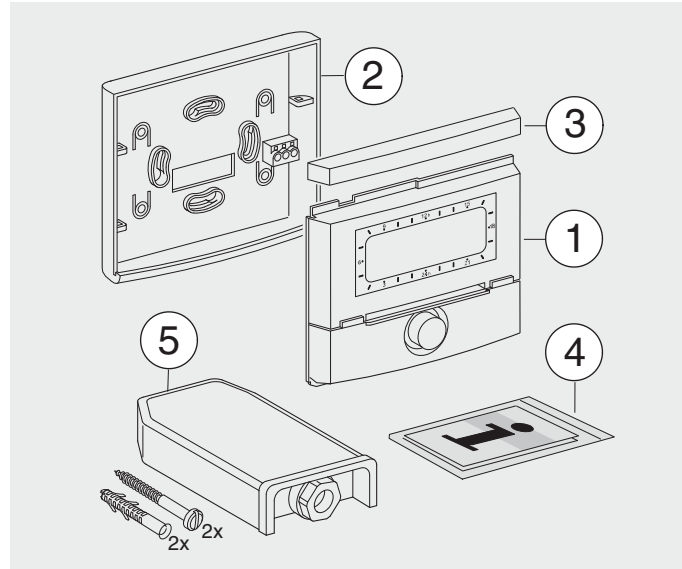


Fig. 1 FW200 Energy Management System

- 1 Controls top section
- 2 Base for wall-mounting
- 3 Top cover
- 4 Installation and operating instructions
- 5 Outdoor temperature sensor with mounting kit

### 1.3 FB100 Remote Control & Room Sensor



The FB100 can only be connected to systems with FW200 and a boiler with BUS-enabled Heatronic 3.

- ▶ The FB100 is a remote room sensor and user interface that is used to display device and system information and to change the settings of that particular zone.
- ▶ The FB100 is designed for wall mounting.
- ▶ In connection with the IPM2 module, the FB100 controls the assigned heating circuit using a timer program. Three weekly heating programs with six switch points per day are available for a heating circuit (one program is active).
- ▶ Maximum of four FB100 in a heating system with FW200.
- ▶ In case of power failure, the display will be off. All settings are saved.

Scope of delivery

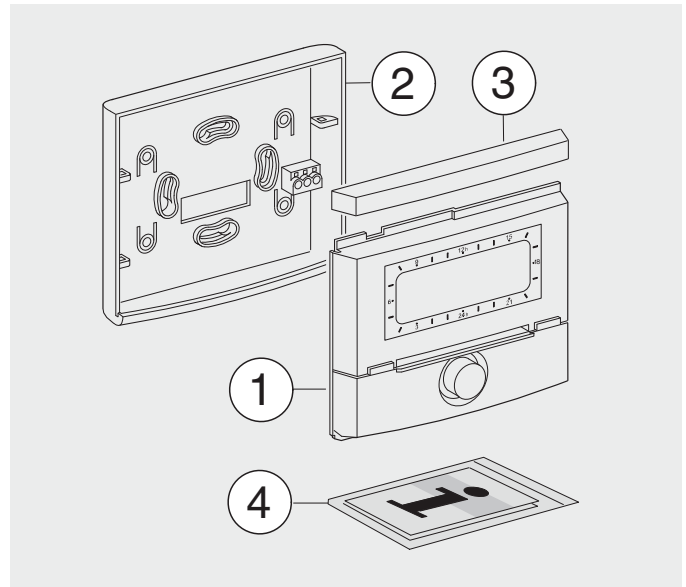


Fig. 2 FB100 Remote Control & Room Sensor

1 Upper part of remote control

2 Base for wall-mounting

3 Top cover

4 Installation and operating instructions

## 1.4 IPM2 Space Heating Module

The IPM2 module operates pumps and mixing valves of 2 heating zones. Each zone is run independently based on the programming and feedback from the FB100 room sensor (if installed). Instead of a second zone a DHW recirculation pump can also be controlled by the IMP-2.

Combination overview	
Outdoor reset controls and primary room sensor	FW200
Remote control for additional zones	FB100
Available systems	2 mixed heating zones
	1 mixed heating zone + 1 unmixed heating zone + 1 DHW recirculation pump
	2 unmixed heating zones + 1 DHW recirculation pump
	1 mixed heating zone + 1 storage tank + 1 DHW tank loading pump
	1 unmixed heating zone + 1 storage tank + 1 DHW tank loading pump
Max. number of Modules per system	max. 5 IPM2

Tab. 1

## 1.5 ISM2 Solar Module

The ISM2 module controls the components of a solar thermal system. Integration of solar thermal with a boiler and central heating system for backup brings additional benefits as it allows minimizing boiler run time and reduces burner starts significantly compared to a non-integrated system.

### Combination overview

With the ISM2 module, it is possible to realize a variety of solar thermal systems.

### Basic solar thermal systems

- ▶ System 1 : Solar thermal DHW heating
- ▶ System 2 : Solar thermal DHW heating and space heating support

### System expansions

- ▶ Option A : Two collector arrays (east/west orientation)
- ▶ Option B : Reloading system with two single coil DHW tanks
- ▶ Option C : First/second priority system with 2 tanks, realized with
  - p-p : a separate pump for each tank
  - p-v : common pump and diverter valve
- ▶ Option D : External heat exchanger on the solar circuit
- ▶ Option E : Thermal disinfection of the solar tank

Combine a basic system with one or several options to realize the desired solar system.

This manual shows basic solar thermal DHW systems only. For information on all options, please consult the Installation and Service Manual.



## 2 Applications

### Legend



Fig. 3 Legend

**NOTICE:** All drawings in this manual are conceptual in nature and only depict components relevant for the systems shown. It is the installer's responsibility to know national and local code and install safety devices as required. Install and size peripheral devices such as air purge, expansion vessel, feeder valve, mud separator, shutoff valves, etc. per best installation practices. Contact Bosch with installation related questions.

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## List of most common applications

### Single Zone Baseboard Systems:

- ▶ System 1: Greenstar Heating Boiler in a single zone system (page 13-16).
- ▶ System 2: Greenstar Combi-Boiler in a single zone system (page 17-20).
- ▶ System 3: Greenstar Heating Boiler in a single zone system with DHW tank loading ( page 21-24).
- ▶ System 4: Greenstar Heating Boiler in a single zone system with solar thermal DHW and boiler backup (page 25-28).

### Single Zone Systems with Primary/Secondary Piping:

- ▶ System 5: Greenstar Heating Boiler in a single zone system (page 29-32)
- ▶ System 6: Greenstar Combi-Boiler in a single zone system (page 33-36).
- ▶ System 7: Greenstar Heating Boiler in a single zone system with DHW tank loading (page 37-40)
- ▶ System 8: Greenstar Heating Boiler in a single zone system with room thermostat and DHW tank loading (page 41-44).
- ▶ System 9: Greenstar Heating Boiler in a single zone system with solar thermal DHW and boiler backup (page 45-48).

### Multi-zone Systems with Primary/Secondary Piping:

- ▶ System 10: Greenstar Heating Boiler with zone pumps and room thermostats (page 49-52).
- ▶ System 11: Greenstar Heating Boiler with zone pumps, room thermostats, and DHW tank loading (page 53-56).
- ▶ System 12: Greenstar Heating Boiler with zone valves and room thermostats ( page 57-60).

## Boiler pump capacity in single zone systems

When installing the boiler in a single zone application without primary/secondary piping, it is critical not to overload the pump. Use the Greenstar Heating or Combi Boiler in this setup only in low pressure baseboard applications. Radiant floor, panel radiator, or multi-zone applications require primary/secondary piping. Do not install zone valves with this system.

**Recommended maximum: 70' (21 m) of 3/4" baseboard at a 20°F delta T and a flow rate of 4.0 gpm. This allows sufficient reserves for the necessary supply and return piping plus elbows.**

Alternatively determine the system pressure drop on a case by case basis to verify that the boiler pump is capable of delivering the required flow rate. Table 2 provides as an example the pressure drop of 100' of 3/4" baseboard and its relevant heat output.

Water Flow	Pressure Drop per 100'	MBH output per 100' at shown Medium Water Temperature and 65°F Room Temperature							
GPM	feet of head	110°F	120°F	130°F	140°F	150°F	160°F	170°F	180°F
4	4.375	16	12	26	32	38	46	54	61

Tab. 2 Pressure drop and heat output for 3/4" baseboard

Add to that the pressure drop of supply and return piping plus elbows and other devices like check valves.

Use the pump curves on the following page to verify that the pump is capable of delivering the needed flow rate for the given pressure drop of the system.



In order to save as much energy as possible and keep water circulation noises to a minimum, select the lowest possible pump speed.

If the working pressure cannot be met, use primary/secondary piping.

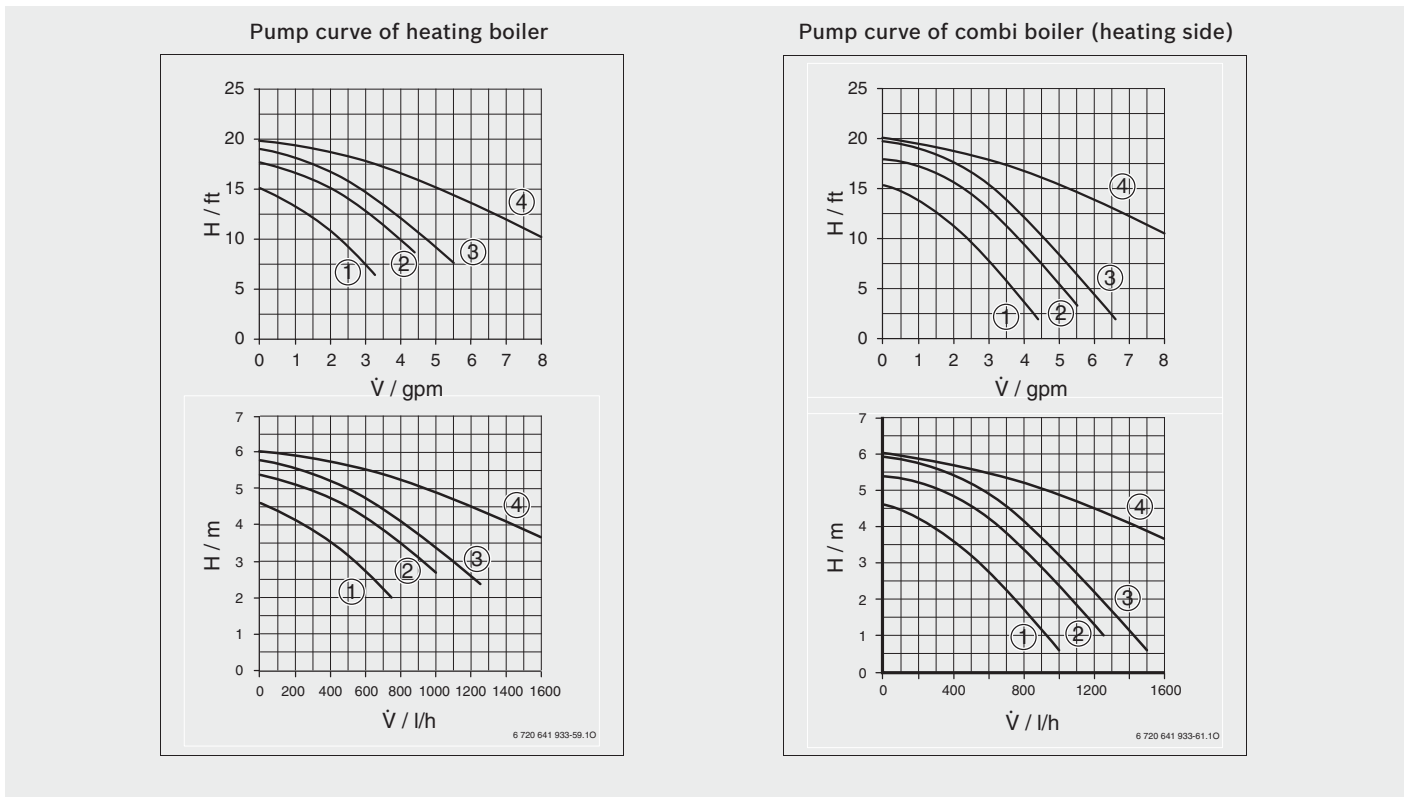


Fig. 4 Greenstar boiler pump curves

**Key to Fig. 4**

- 1** Residual head pressure at speed 1
- 2** Residual head pressure at speed 2
- 3** Residual head pressure at speed 3 (default setting)
- 4** Head pressure of the boiler pump by itself (at speed 3)
- H** Head pressure in feet of head (m)
- V** Circulating water volume in gallons per minute (l/h)

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## 2.1 System 1: Greenstar Heating Boiler in a single zone system

### Summary:

Single boiler supplying one baseboard heating zone equipped with FW200 outdoor reset controller with built-in room sensor in the living space. This system is using the boiler pump for zone water circulation.

This design can only be used with a single loop baseboard system that has a low pressure drop. Radiant floors, panel radiator, or multi zone systems require primary-secondary piping. Do not install zone valves with this system.

The pump will run in constant circulation except when in warm weather shutdown.

Max. 70' (21 m) of 3/4" baseboard at a 20°F delta T and a flow rate of 4.0 gpm plus the necessary supply and return piping.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted, it also uses room temperature to adjust the heating curve and modify boiler supply temperature.

FW200 provides warm weather shutdown.

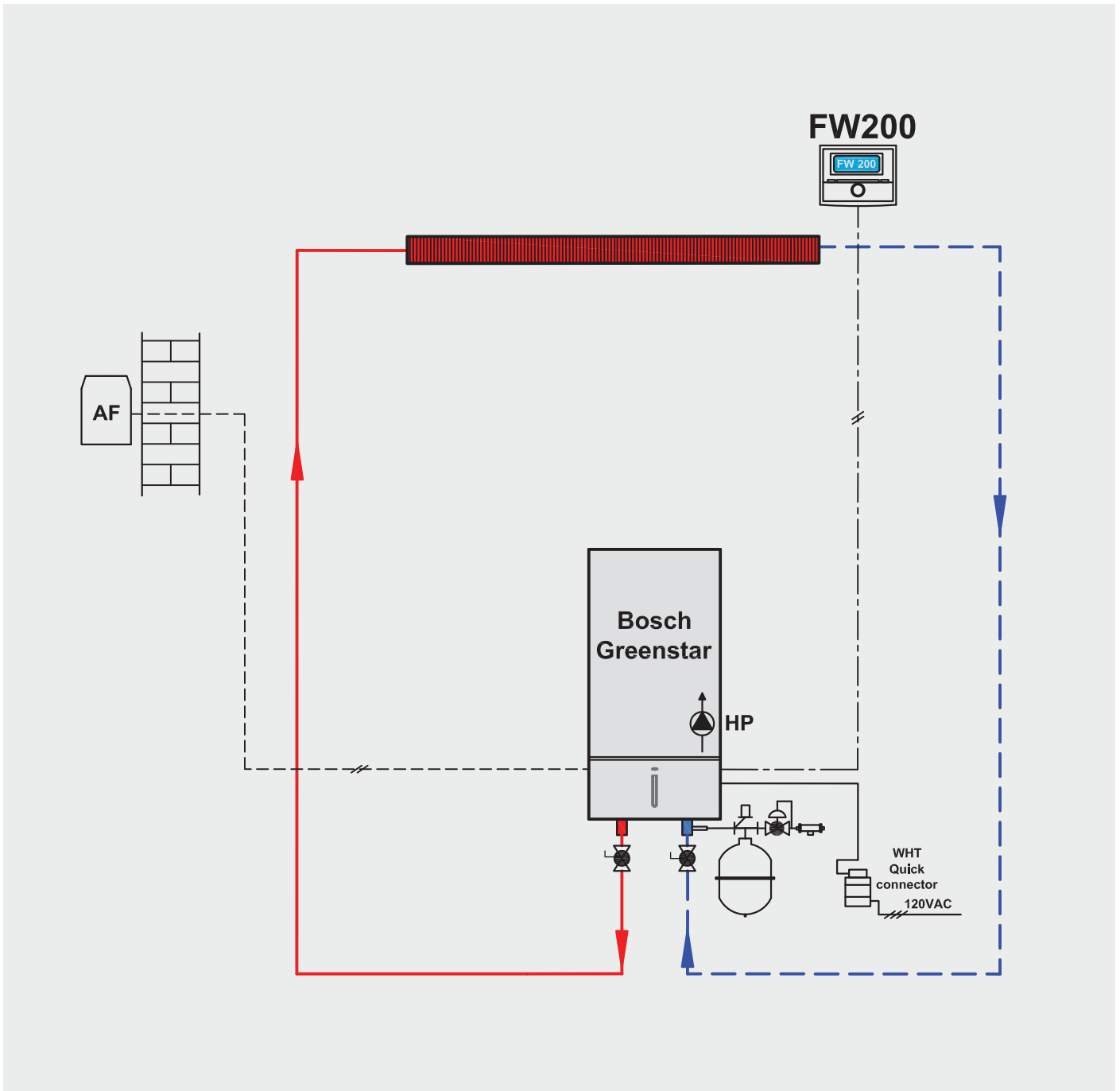
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the room.

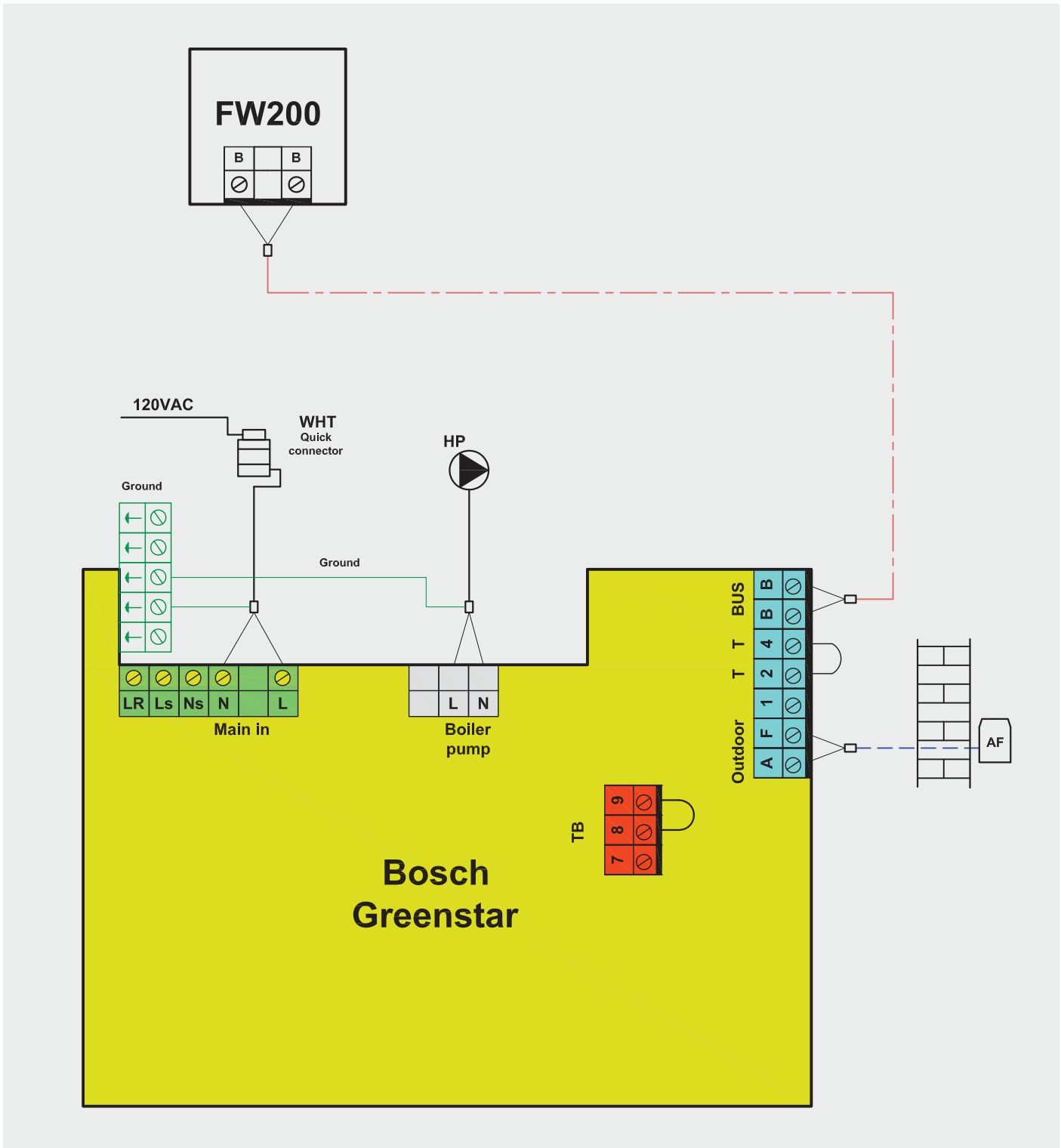
### Additional instructions:

See manufacturer's installation and operating instructions.

System 1 - Piping Diagram



System 1 - Wiring Diagram



### System 1: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit type to Baseboard.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as they apply to the system.

- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information:

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
  - The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.



## 2.2 System 2: Greenstar Combi Boiler in a single zone system

### Summary:

Single combi-boiler supplying one baseboard heating zone equipped with FW200 outdoor reset controller with built-in room sensor in the living space. DHW generation directly off the boiler through the tankless heat exchanger. This system is using the boiler pump for zone water circulation.

The “combi” or combination boiler is a high efficiency central heating boiler and water heater combined within one compact unit. Water is heated on demand directly from the water main eliminating the need for a hot water storage tank.

This design can only be used with a single loop baseboard system that has a low pressure drop. Radiant floors, panel radiator, or multi zone systems require primary-secondary piping. Do not install zone valves with this system.

The pump will run in constant circulation while in space heating mode except during a call for DHW or when in warm weather shutdown.

Max. 70' (21 m) of 3/4" baseboard at a 20°F delta T and a flow rate of 4.0 gpm plus the necessary supply and return piping..

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted, it also uses room temperature to adjust the heating curve and modify boiler supply temperature.

FW200 provides warm weather shutdown.

### Required components:

- ▶ Greenstar combi-boiler.
- ▶ FW200 controller in the room.

### Additional instructions:

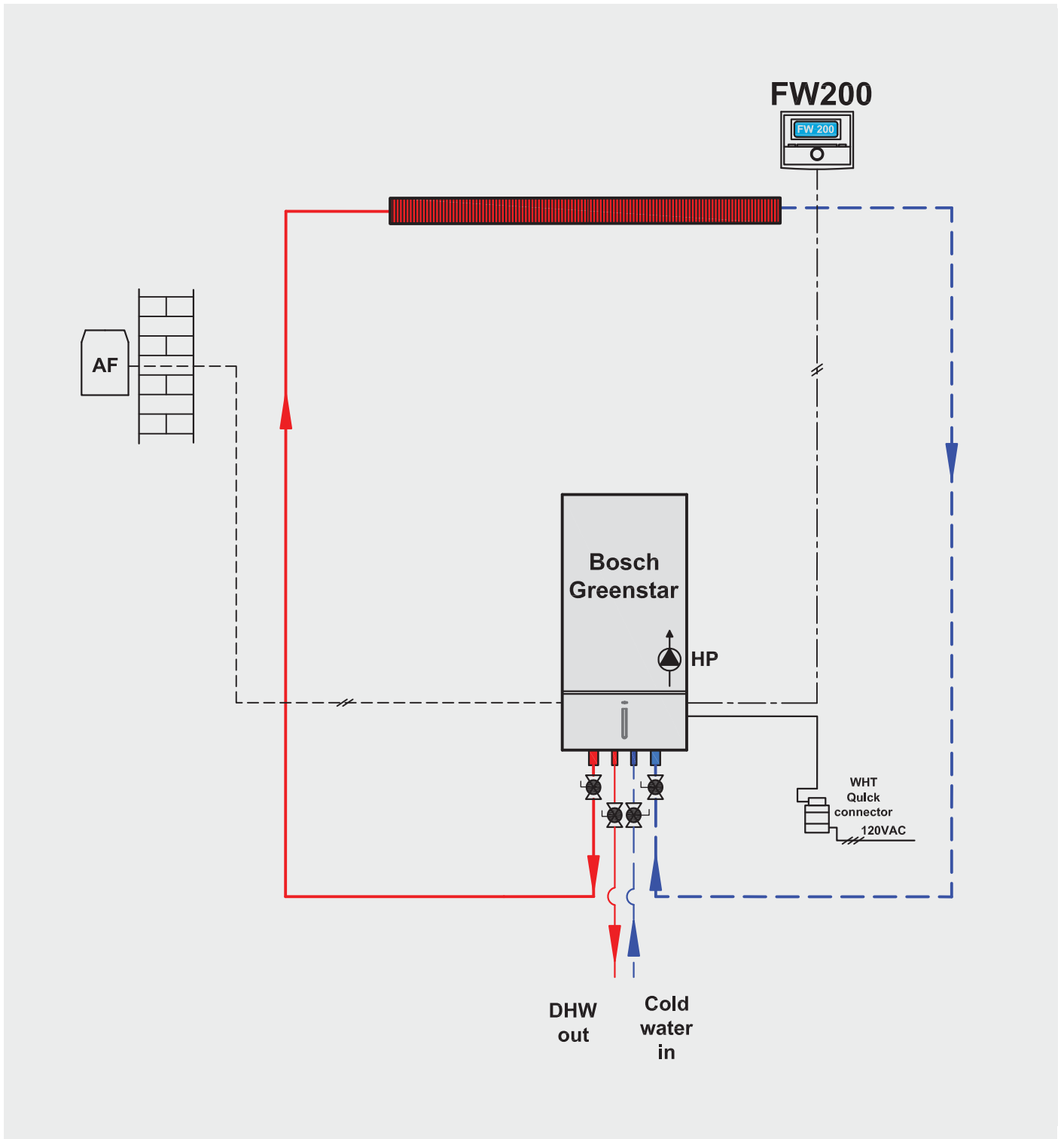
See manufacturer’s installation and operating instructions.

Install an adequately sized Pressure Relief Valve (PRV) on the DHW outlet of the combi boiler.

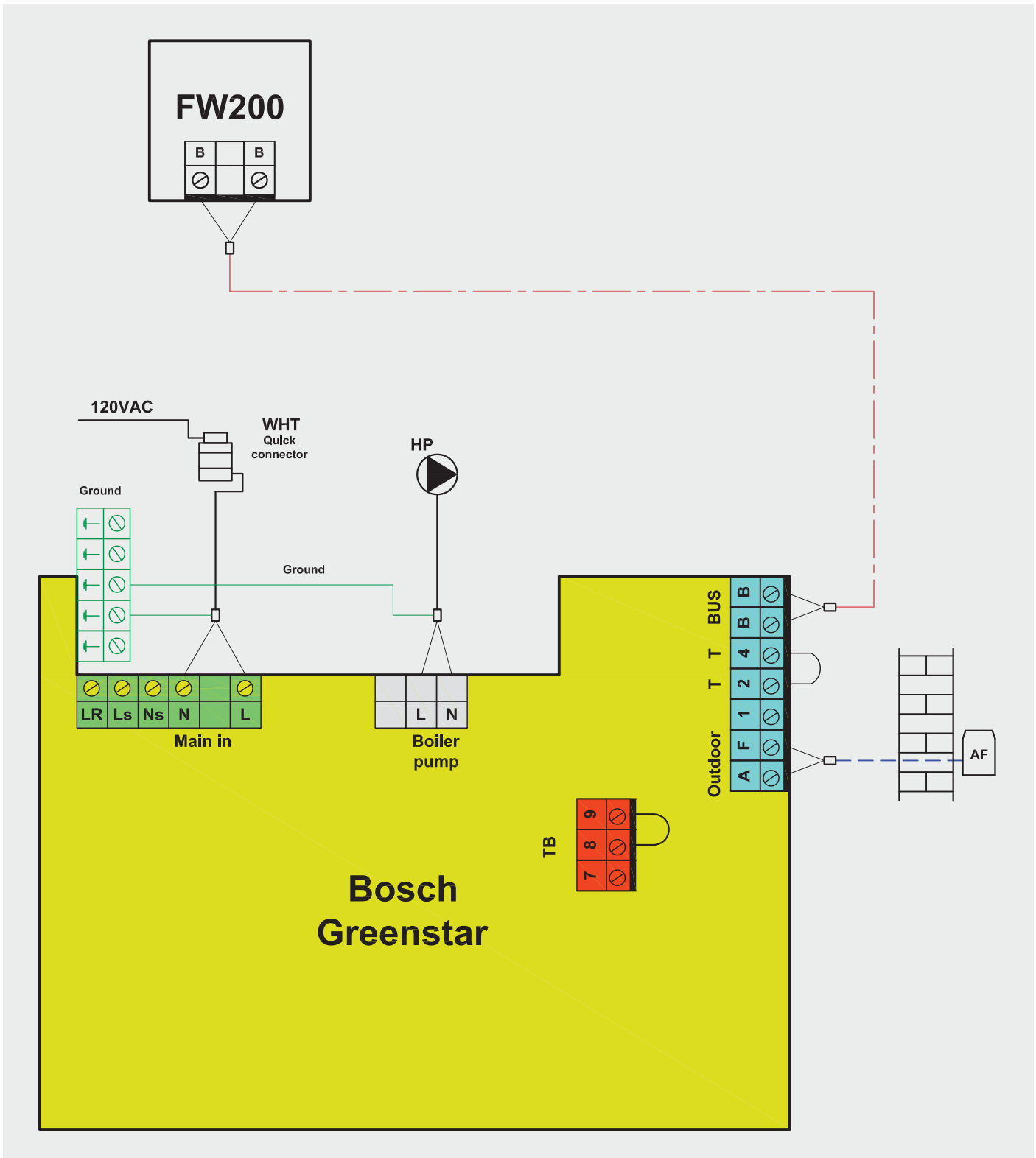
To reduce the risk of scalding it is recommended to install a DHW tempering valve.

The Greenstar combi boiler is equipped with an internal 3.17 gal (12 liter) expansion vessel. The installation manual provides information on how to determine if it is of sufficient capacity for the application or if an additional expansion vessel is needed.

System 2 - Piping diagram



System 2 - Wiring diagram



## System 2: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

DHW is generated directly by the combi-boiler without the need for a storage tank.

### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit type to Baseboard.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ For additional features of the combi boiler see the installation manual.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.

## 2.3 System 3: Greenstar Heating Boiler in a single zone system with DHW tank loading

### Summary:

Single boiler supplying one baseboard heating zone equipped with FW200 outdoor reset controller with built-in room sensor in the living space. This system is using the boiler pump for zone water circulation and DHW tank loading. A diverter valve is used to switch between space heating and tank loading. This system is identical to System 1 with an added indirect fired DHW tank.

This design can only be used with a single loop baseboard system that has a low pressure drop. Radiant floors, panel radiator, or multi zone systems require primary-secondary piping.

Max. 70' (21 m) of 3/4" baseboard at a 20°F delta T and a flow rate of 4.0 gpm plus the necessary supply and return piping.

Ensure to select a DHW tank with a coil pressure drop that does not exceed the capacity of the boiler pump.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted, it also uses room temperature to adjust the heating curve and modify boiler supply temperature.

FW200 provides warm weather shutdown.

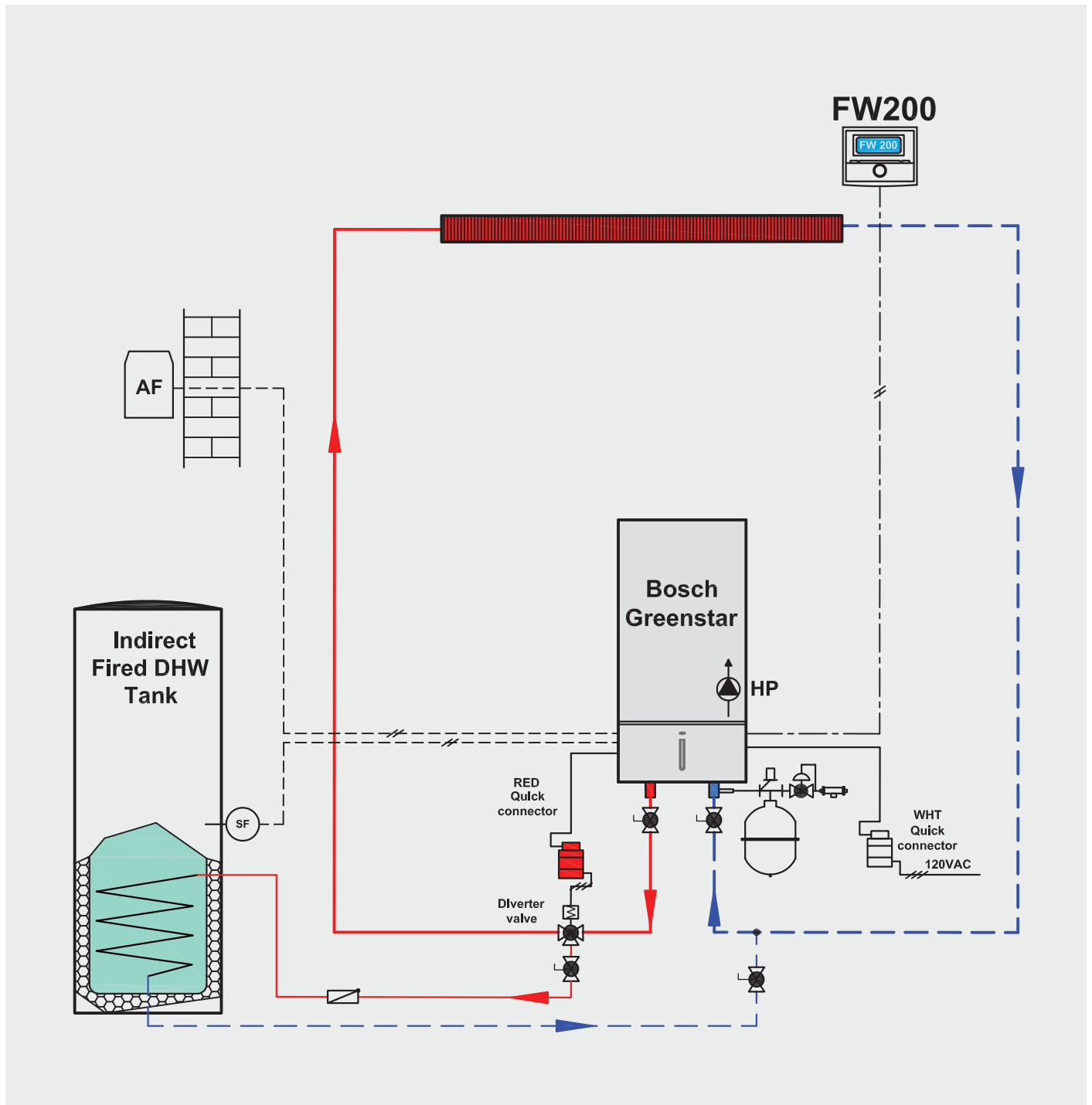
### Required components:

- ▶ Greenstar combi-boiler.
- ▶ FW200 controller in the room.
- ▶ Indirect Fired DHW Tank.
- ▶ Diverter valve 120VAC, 3-way, spring return.

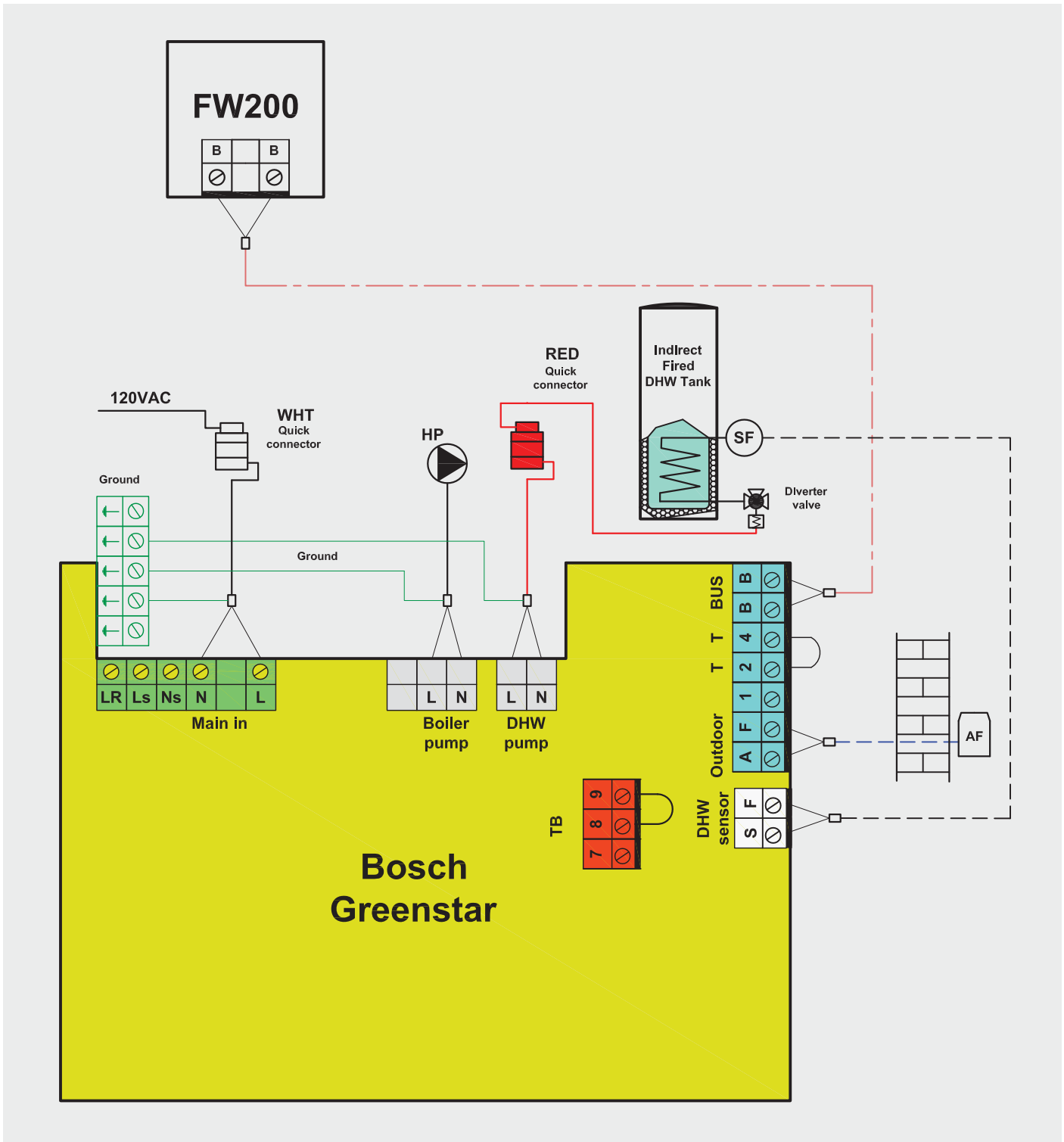
### Additional instructions:

See manufacturer's installation and operating instructions.

System 3 - Piping diagram



System 3 - Wiring diagram



### System 3: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Set up the weekly program for DHW tank loading and the DHW recirculation pump (if installed). Separate individual programs can be set up or the hours of operation can be linked to the heating program.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit type to Baseboard.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.



## 2.4 System 4: Greenstar Heating Boiler in a single zone system with solar thermal DHW and boiler backup

### Summary:

Single boiler supplying one baseboard heating zone equipped with FW200 outdoor reset controller with built-in room sensor in the living space. This system is using the boiler pump for zone water circulation and DHW tank loading. A diverter valve is used to switch between space heating and tank loading. This system is identical to System 3 with an added solar thermal DHW heating system.

This design can only be used with a single loop baseboard system that has a low pressure drop. Radiant floors, panel radiator, or multi zone systems require primary-secondary piping. Do not install zone valves with this system.

Max. 70' (21 m) of 3/4" baseboard at a 20°F delta T and a flow rate of 4.0 gpm plus the necessary supply and return piping.

Ensure to select a solar tank with a boiler coil pressure drop that does not exceed the capacity of the boiler pump (see pages 11 & 12 for details).

Solar thermal provides renewable energy to heat DHW year round, and if sized properly reduce energy consumption significantly. Bosch offers plug and play components that are designed to work together with a boiler backup system. Bosch solar thermal systems are qualified for government and utility incentives reducing the upfront investment cost significantly. Bosch solar thermal collectors work even in the winter and under cloudy skies preheating water, and reducing boiler run time and burner starts.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted, it also uses room temperature to adjust the heating curve and modify boiler supply temperature.

FW200 provides warm weather shutdown.

The control of the solar thermal system is integrated with the FW200 boiler control, and reduces boiler run time and burner starts significantly compared to independent systems. The solar pump will run whenever the collectors are 16°F (9°C) warmer than the bottom of the solar tank.

It is recommended to double the volume of the solar thermal DHW tank compared to an equivalent conventional indirect fired DHW tank. This allows sufficient backup volume ("comfort zone") maintained by the boiler without sacrificing capacity for solar harvesting.

### Required components:

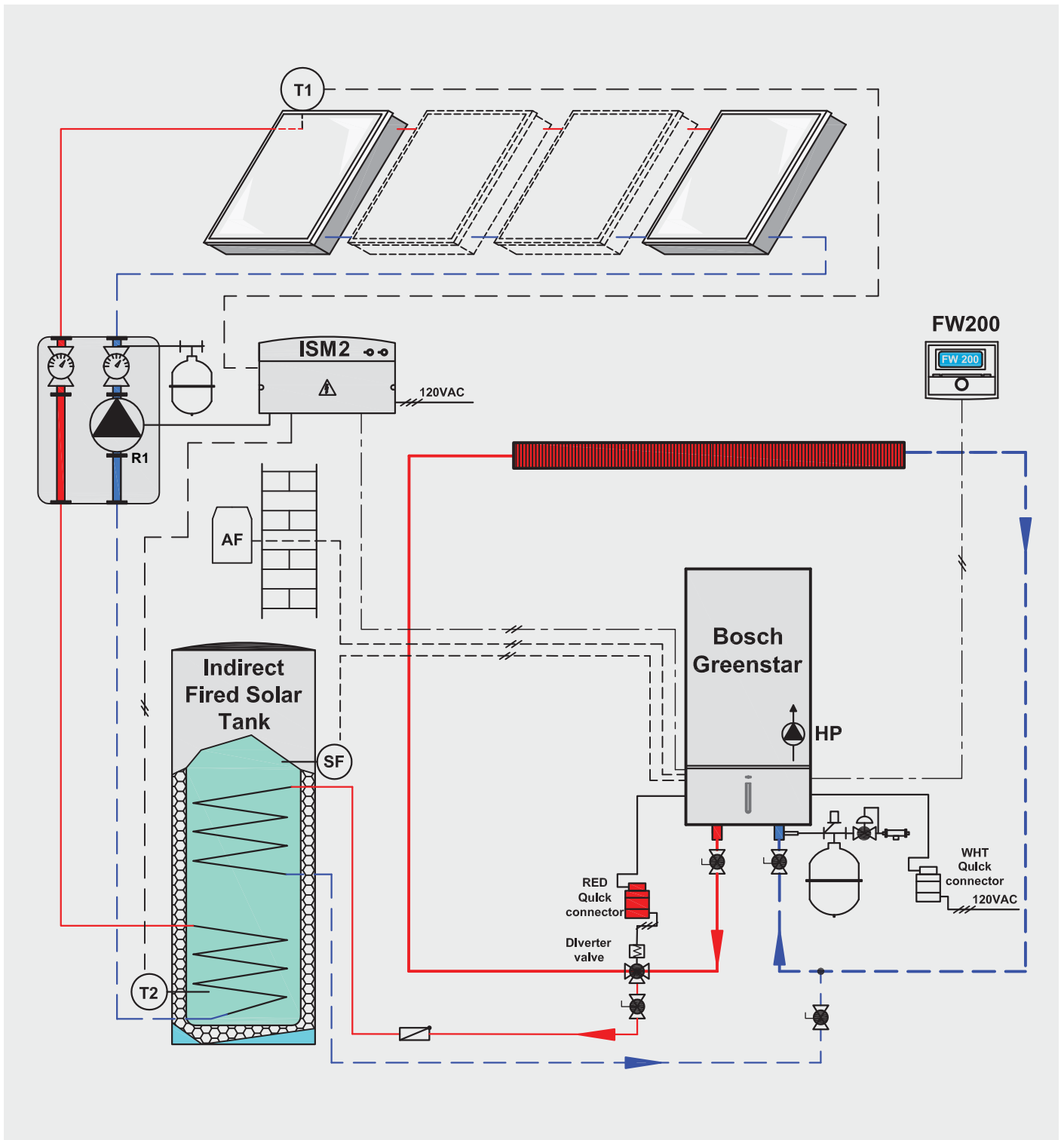
- ▶ Greenstar combi-boiler.
- ▶ FW200 controller in the room.
- ▶ ISM2.
- ▶ DHW solar tank with 2 coils.
- ▶ Bosch solar thermal system complete.
- ▶ Diverter valve 120VAC, 3-way, spring return.

### Additional instructions:

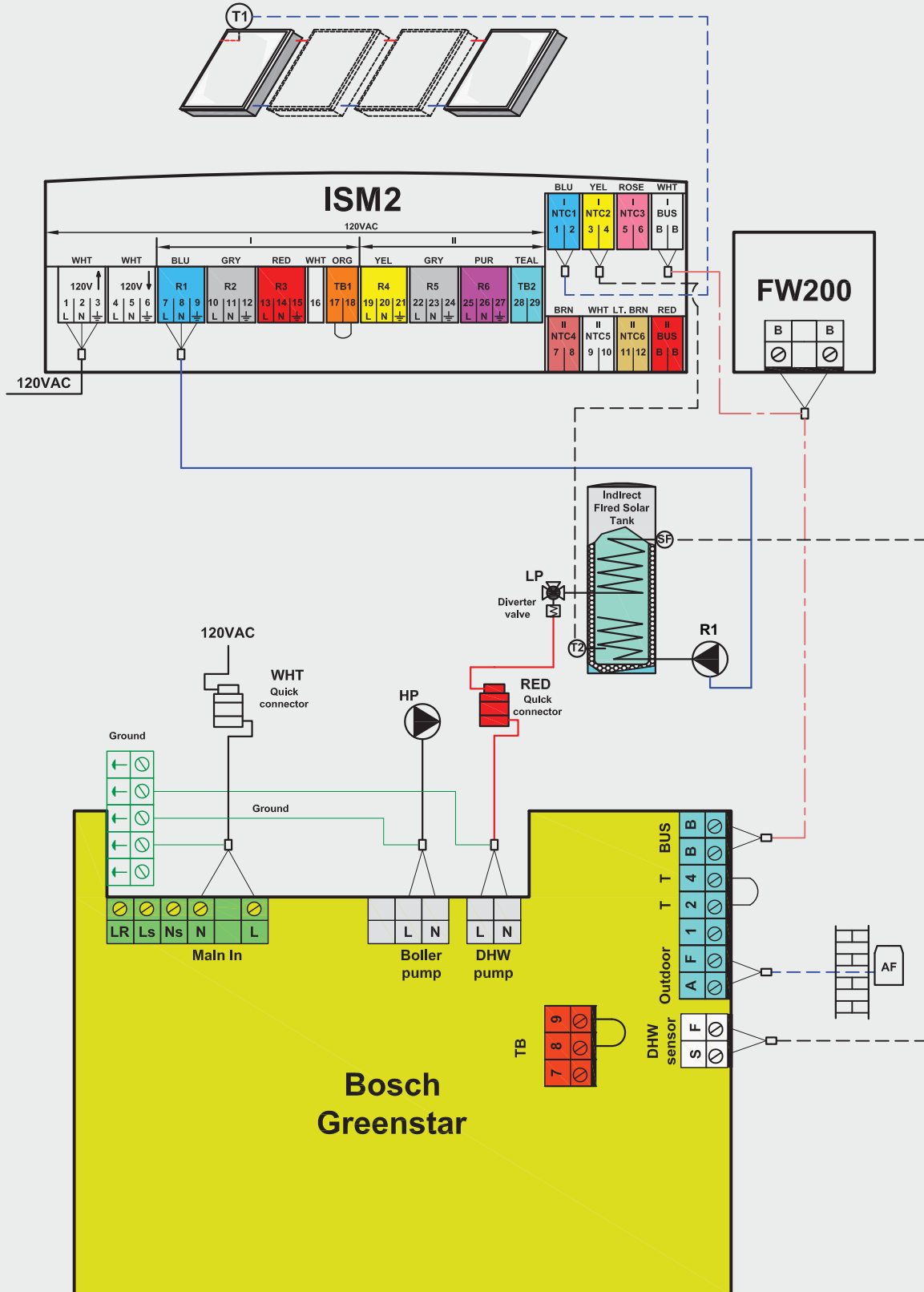
See manufacturer's installation and operating instructions.

The Bosch Greenstar boiler and ISM2 offer many different solar thermal applications including space heating support and pool heating. Please consult the installation and operating instructions for details.

System 4 - Piping diagram



System 4 - Wiring diagram



### System 4: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ Use the FW200 for programming the heating system.
- ▶ When commissioning for the first time, set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy (C)
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Set up the weekly program for DHW tank loading and the DHW recirculation pump (if installed). Separate individual programs can be set up or the hours of operation can be linked to the heating program.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit type to Baseboard.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ Proceed in the installer menu to configure the solar thermal system. The solar system requires manual configuration.
  - Run solar system: Yes
  - Solar system parameters: Standard system.
  - Set options A2 to E as required.
  - It is recommended to keep the factory default solar system parameters.
- ▶ Exit the installer menu.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

The solar thermal system will start harvesting energy once the collector temperature is at least 16°F (9°C) warmer than the bottom of the solar tank. The upper half of the solar tank ("comfort zone") is maintained at temperature as set in the DHW programming. The lower half is available for solar harvesting.

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.

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## 2.5 System 5: Greenstar Heating Boiler in a single zone system

### Summary:

Single boiler with primary/secondary piping configuration supplying one heating zone. Outdoor reset with FW200 controller with built-in room sensor mounted in the living space for room feedback.

Use this design where System 1 cannot be used due to too great a system pressure drop. Primary/secondary piping is also required for radiant floor and panel radiator applications.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted as a room sensor, it uses room temperature to adjust the heating curve and modify boiler supply temperature accordingly.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications, install a thermostatic tempering valve for overheat protection.

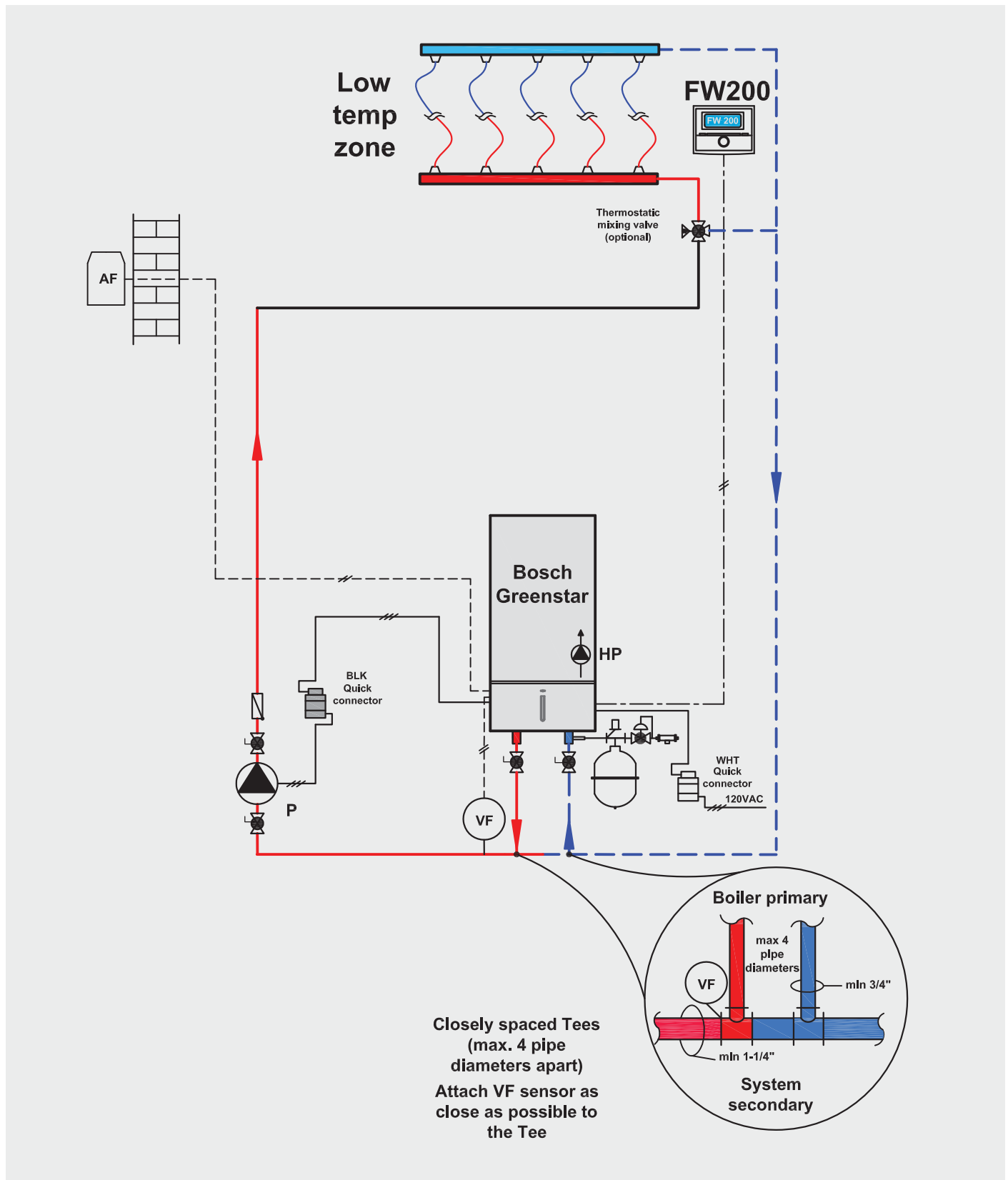
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the room.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).

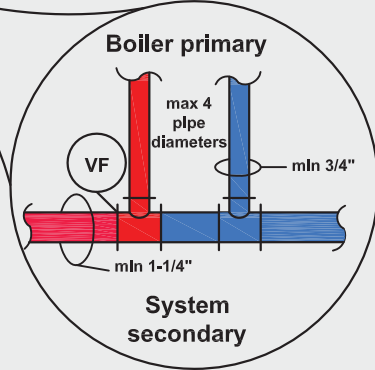
### Additional instructions:

See manufacturer's installation and operating instructions.

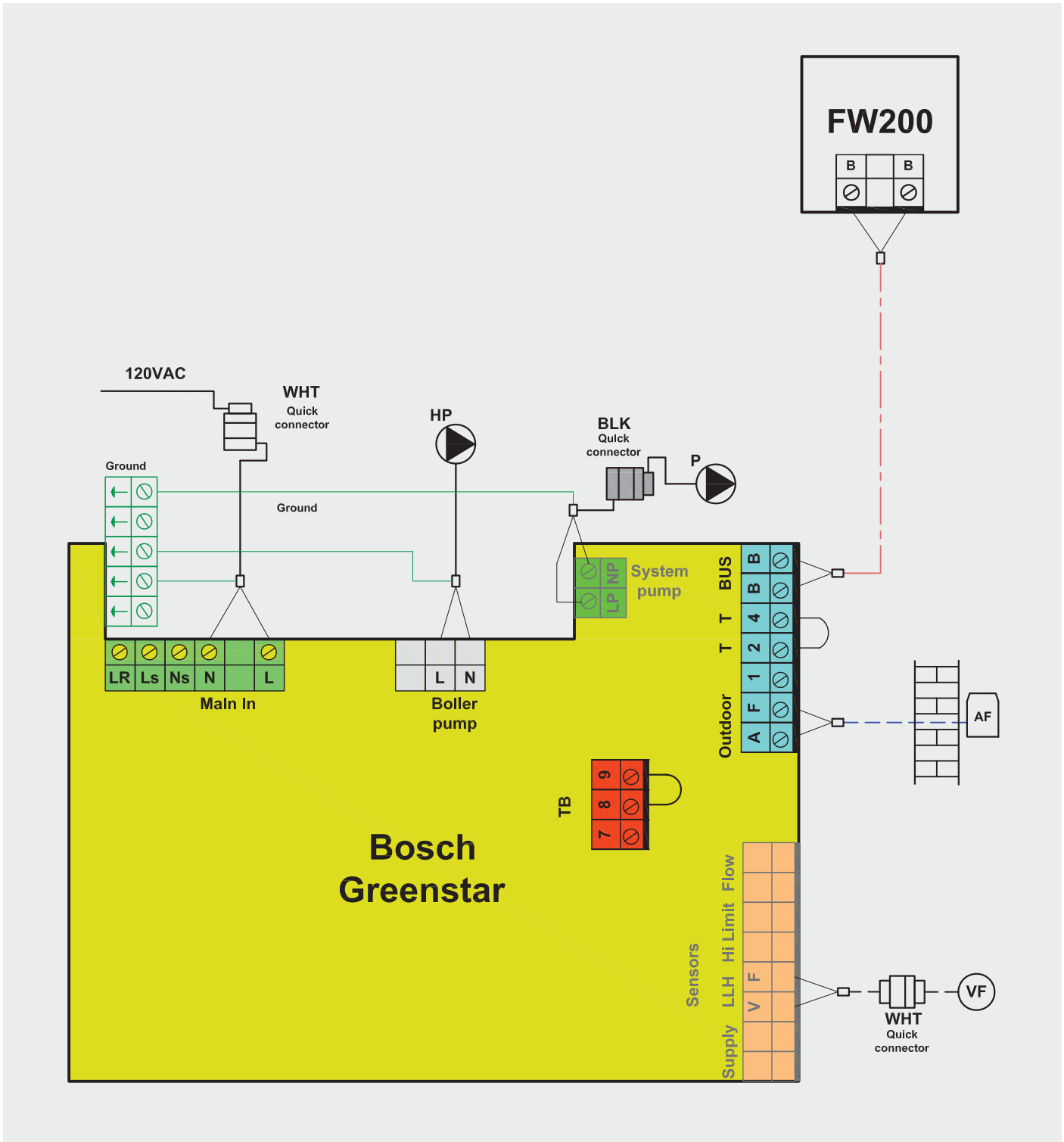
System 5 - Piping diagram



Closely spaced Tees  
(max. 4 pipe diameters apart)  
Attach VF sensor as close as possible to the Tee



System 5 - Wiring diagram



### System 5: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution system used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.



## 2.6 System 6: Greenstar Combi Boiler in a single zone system

### Summary:

Single combi-boiler supplying one heating zone. Outdoor reset with FW200 controller with built-in room sensor mounted in the living space for room feedback. DHW generation directly off the boiler through the tankless heat exchanger. This system is using the boiler pump for zone water circulation.

The “combi” or combination boiler is a high efficiency central heating boiler and water heater combined within one compact unit. Water is heated on demand directly from the water main eliminating the need for a hot water storage tank.

Single boiler with primary/secondary piping configuration supplying one heating zone. Outdoor reset with FW200 controller and room sensor mounted in the living space for room feedback.

Use this design where System 2 cannot be used due to too great a system pressure drop. Primary/secondary piping is also required for radiant floor and panel radiator applications.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted as a room sensor, it uses room temperature to adjust the heating curve and modify boiler supply temperature accordingly.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications, install a thermostatic tempering valve for overheat protection.

### Required components:

- ▶ Greenstar combi-boiler.
- ▶ FW200 controller in the room.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).

### Additional instructions:

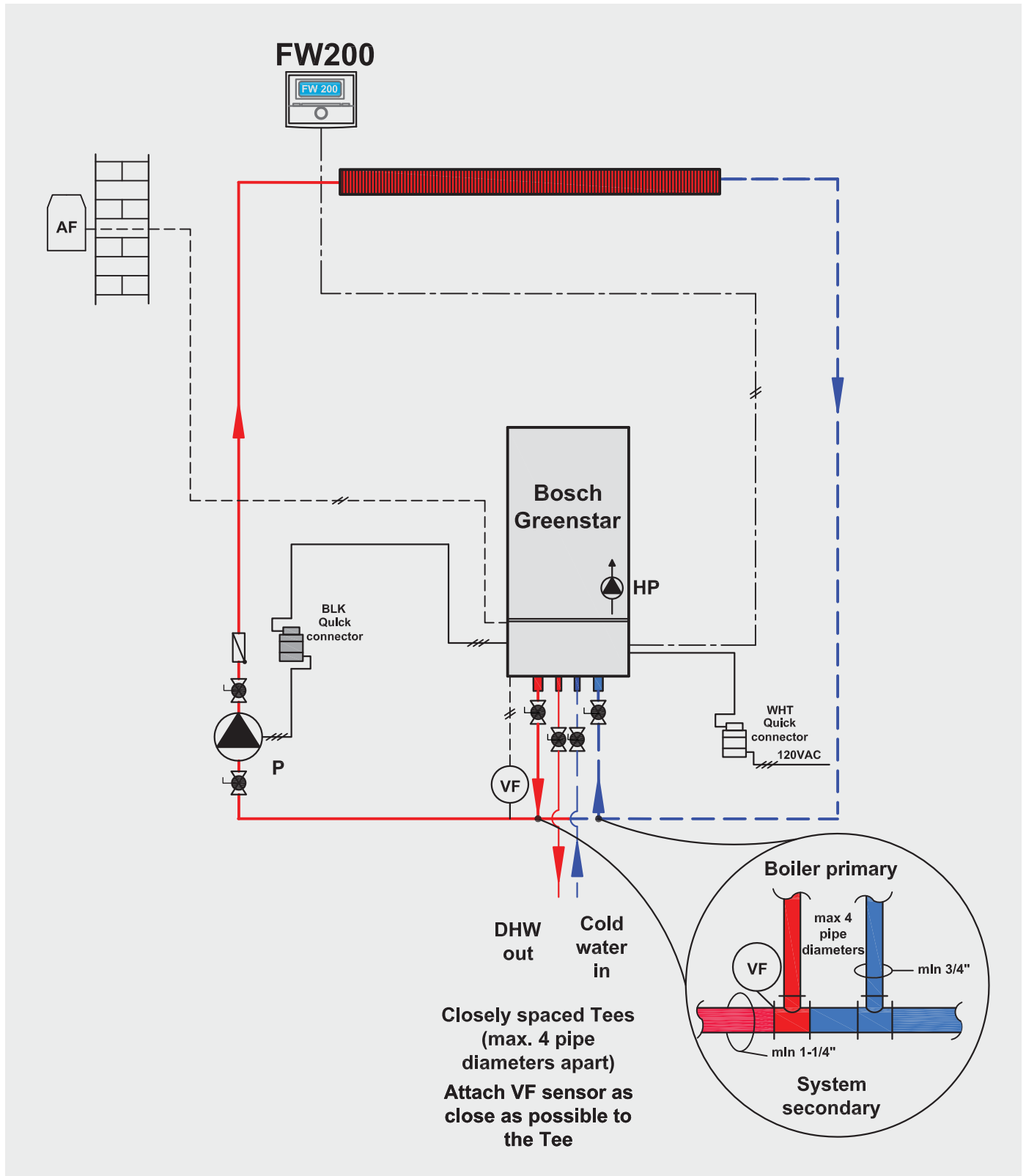
See manufacturer’s installation and operating instructions.

Install an adequately sized Pressure Relief Valve (PRV) on the DHW outlet of the combi boiler.

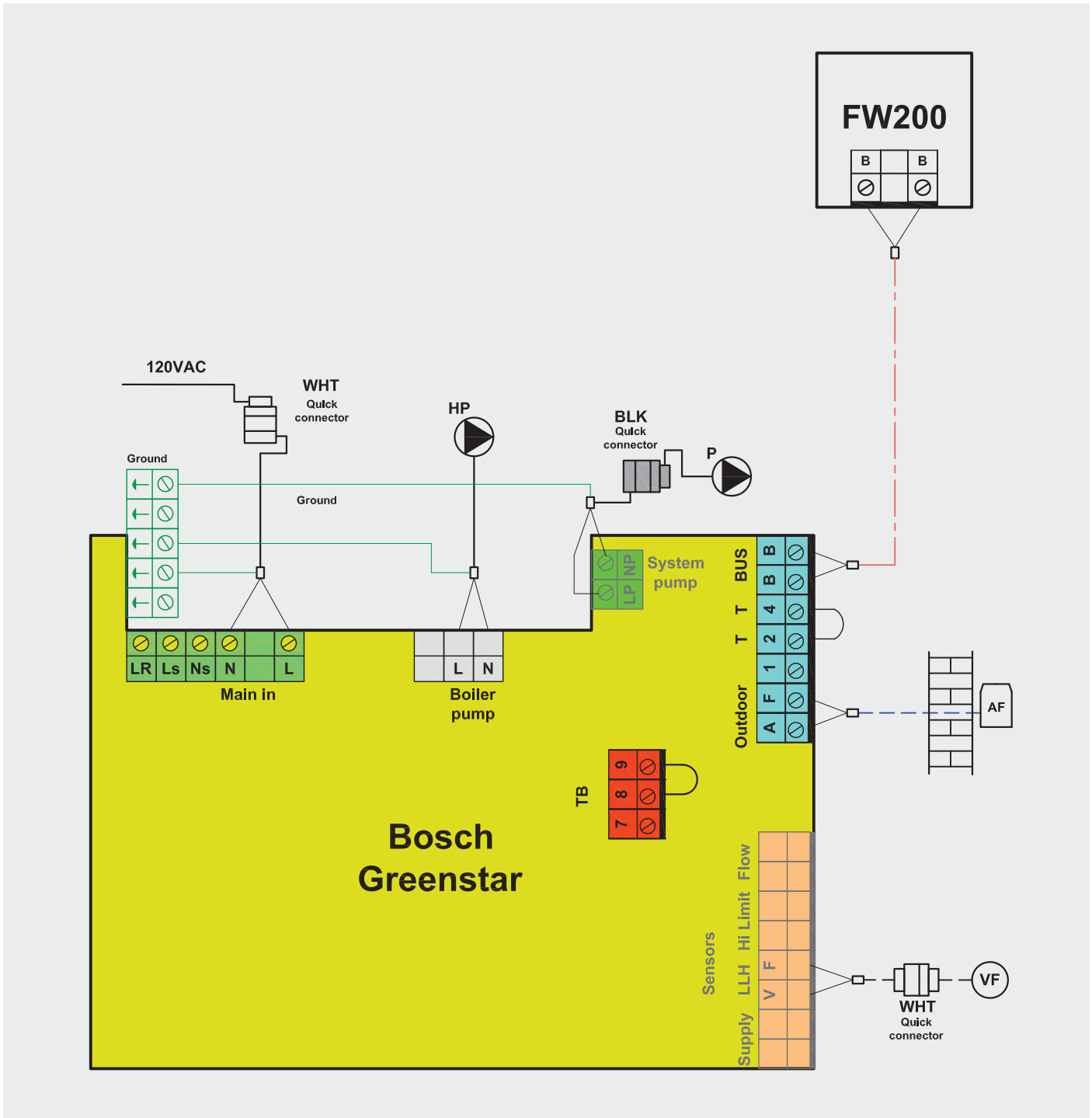
To reduce the risk of scalding it is recommended to install a DHW tempering valve.

The Greenstar combi boiler is equipped with an internal 3.17 gal (12 liter) expansion vessel. The installation manual provides information on how to determine if it is of sufficient capacity for the application or if an additional expansion vessel is needed.

System 6 - Piping diagram



System 6 - Wiring diagram



### System 6: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

DHW is generated directly by the combi-boiler without the need for a storage tank.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution system used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ For additional features of the combi boiler see the installation manual.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.

## 2.7 System 7: Greenstar Heating Boiler in a single zone system with DHW tank loading

### Summary:

Single boiler with primary/secondary piping configuration supplying one heating zone. Outdoor reset with FW200 controller with built-in room sensor mounted in the living space for room feedback.

Use this design where System 3 cannot be used due to too great a system pressure drop. Primary/secondary piping is also required for radiant floor and panel radiator applications.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

This system is identical to System 5 with an added indirect fired DHW tank.

Use this system over System 6 where the combi-boiler does not have the required DHW volume flow capacity; keep in mind however that the tank capacity is not endless compared to that of the combi-boiler.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted as a room sensor, it uses room temperature to adjust the heating curve and modify boiler supply temperature accordingly.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications, install a thermostatic tempering valve for overheat protection.

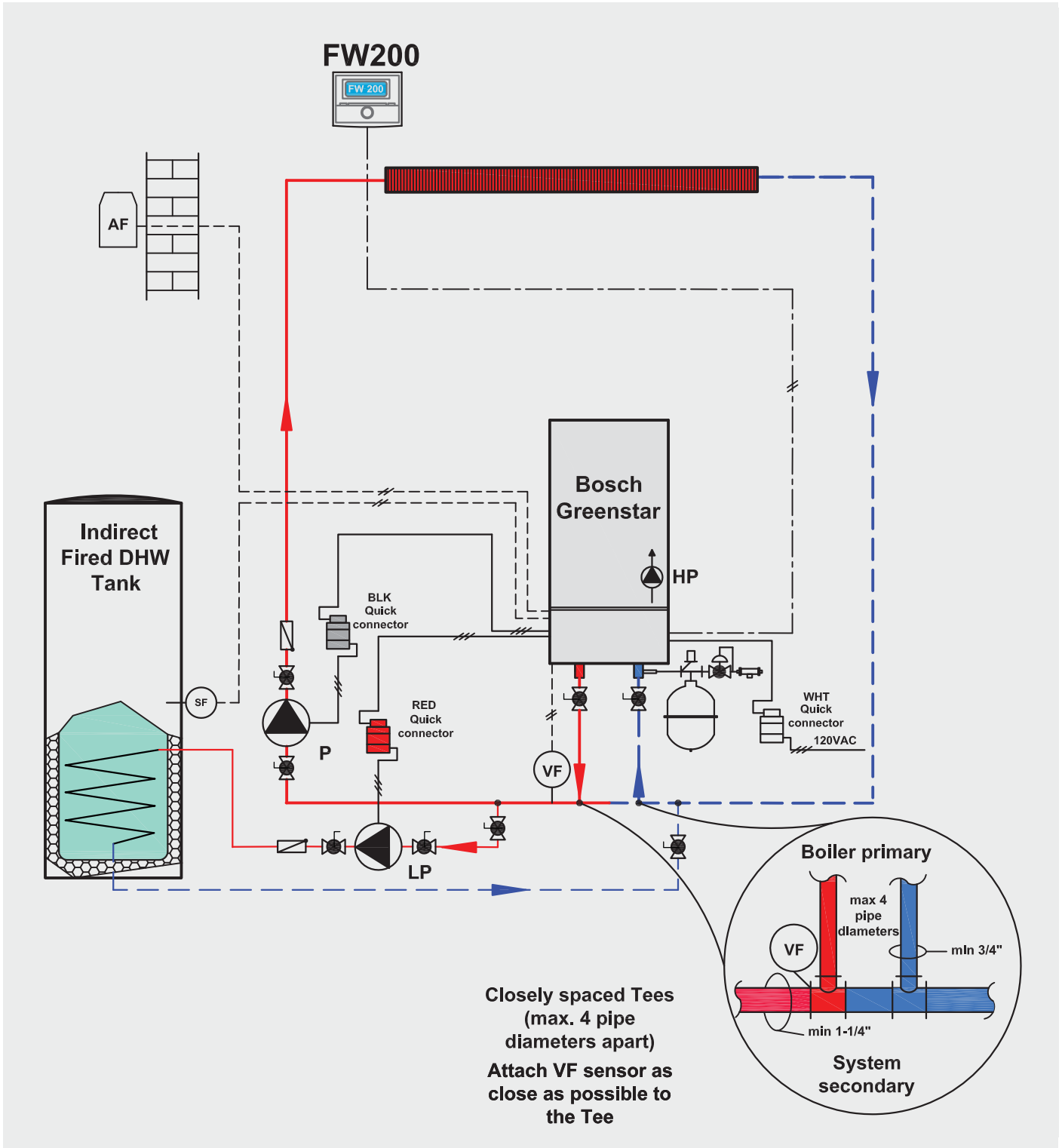
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the room.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ Indirect Fired DHW Tank.
- ▶ Tank loading pump of sufficient capacity.

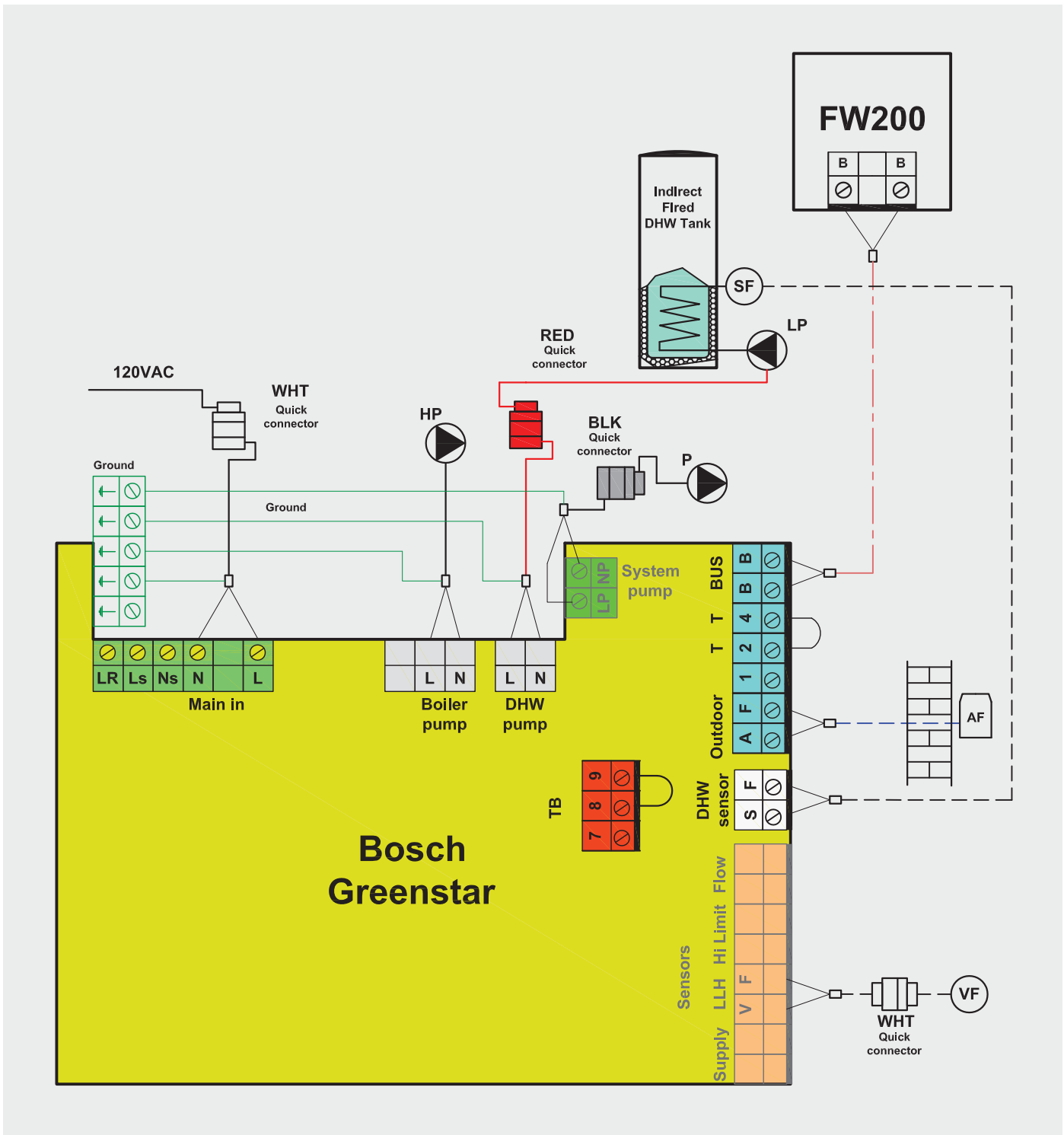
### Additional instructions:

See manufacturer's installation and operating instructions.

System 7 - Piping diagram



System 7 - Wiring diagram



### System 7: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

DHW is generated directly by the combi-boiler without the need for a storage tank.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy ☾
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution system used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the room influence followed by the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When a demand for DHW is sensed by the DHW tank temperature sensor, the boiler will go into DHW mode. When DHW is satisfied, or after one hour, the boiler will return to space heating mode.



## 2.8 System 8: Greenstar Heating Boiler in a single zone system with room thermostat and DHW tank loading

### Summary:

Single boiler with primary/secondary piping configuration supplying one heating zone. Outdoor reset with FW200 controller mounted on the boiler. 3rd party room thermostat used to communicate heat demand.

This system is identical to System 7 except that it does not feature constant circulation. The system circulator runs only when a heat demand is communicated by the room thermostat and shut off when the heat demand goes away.

Use this design where Systems 1 through 4 cannot be used due to too great a system pressure drop. Primary/secondary piping is also required for radiant floor and panel radiator applications.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

This system is designed for installations with other heat sources, e.g. wood stoves or significant solar gain. Compared to systems with the FW200 installed in the room that will throttle down the boiler output when the room reaches its set point, in this setup the thermostat will shut the boiler off.

This system can also be used with a combi boiler (see system 6) instead of the indirect fired DHW tank.

### In detail:

This system runs on pure outdoor reset without room feedback on the heating curve. The FW200 installed in the boiler adjusts the heating curve (boiler supply temperature) according to outdoor temperature. The 3rd party room thermostat turns the boiler on and off based on the conditions in the living space.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications, install a thermostatic tempering valve for overheat protection.

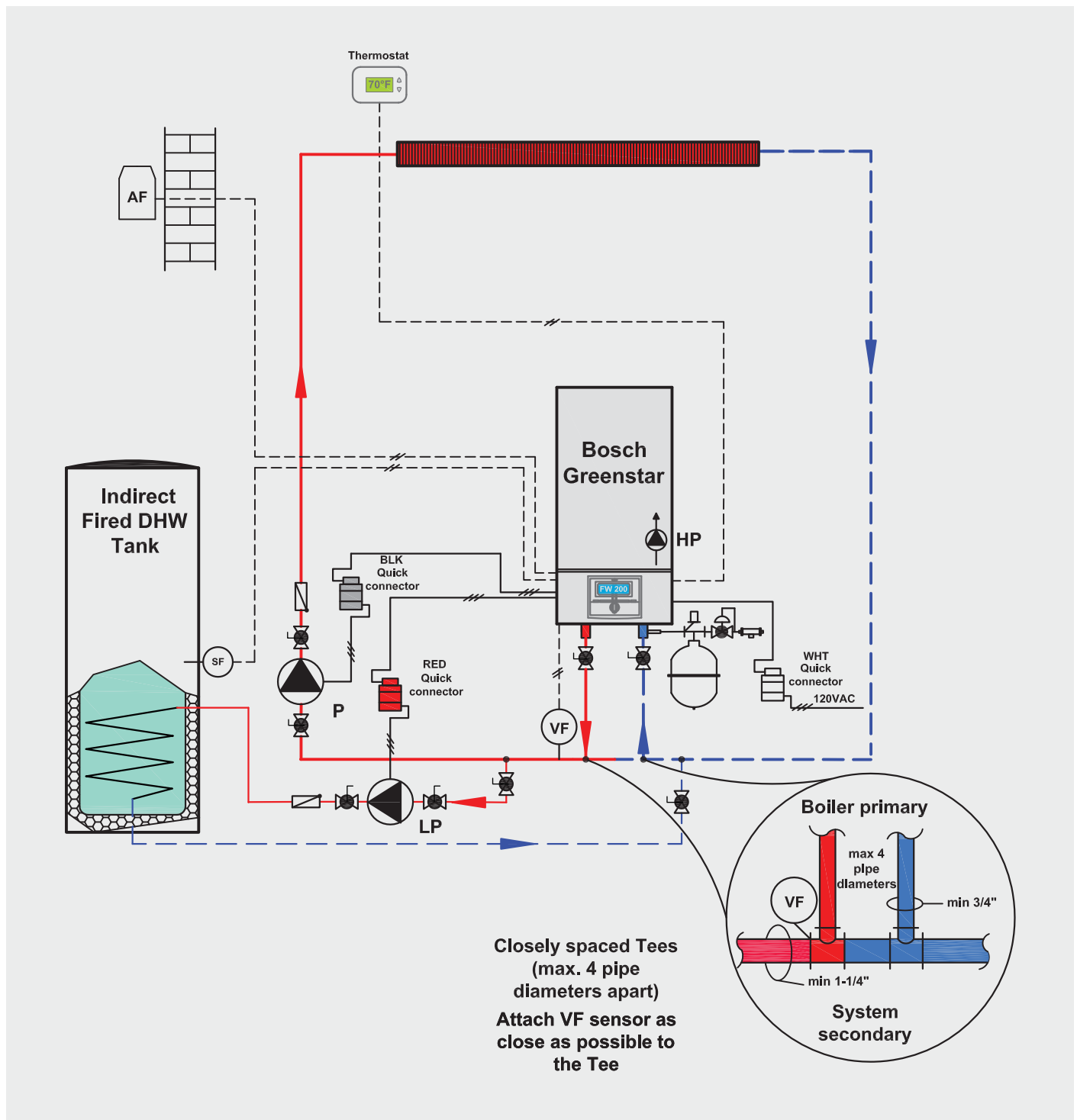
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the room.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ 3rd party room thermostat ; self powered with dry contact closure.
- ▶ Indirect Fired DHW Tank.
- ▶ Tank loading pump of sufficient capacity.

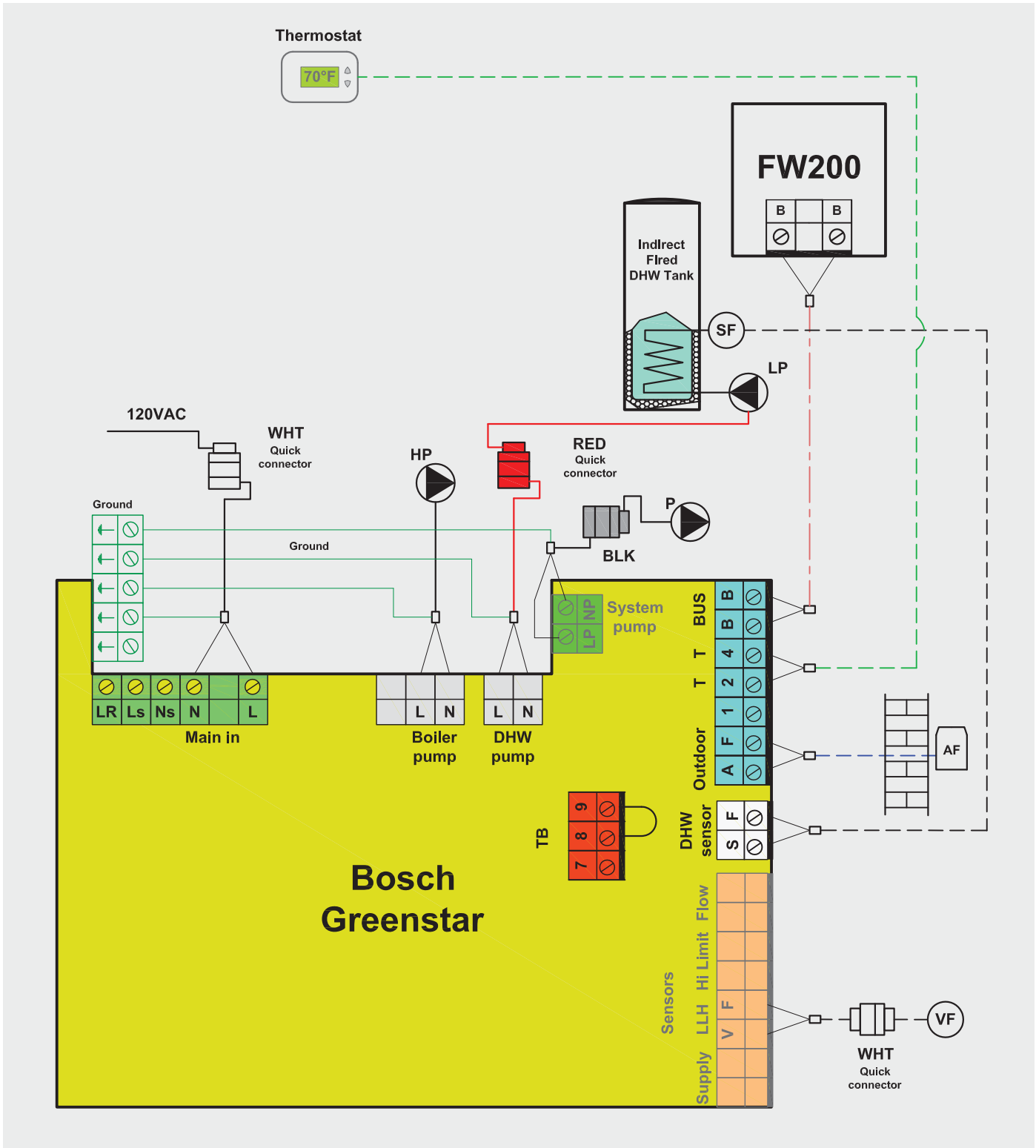
### Additional instructions:

See manufacturer's installation and operating instructions.

System 8 - Piping diagram



System 8 - Wiring diagram



### System 8: Setup and Programming

In this single zone system the FW200 is installed in the boiler for pure outdoor reset without room influence. Install a suitable 3rd party thermostat in the living space in a location that represents the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to malfunctioning.

DHW is generated by the boiler loading the indirect fired DHW tank following the DHW program.

#### Initial setup:

Program the 3rd party room thermostat according to the manufacturer's instructions. It is recommended to set up a day and night heating program with reduced temperatures at night and when the home is unoccupied.

#### Boiler and FW200 programming:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set the boiler for permanent day mode by switching the dial on the FW200 to
  - Comfort ☀
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution system used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve. There is no room influence on the heating curve in this system. When the zone is satisfied the boiler and pump will shut off.

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump unless the 3rd party room thermostat is satisfied prior.
- ▶ When a demand for DHW is sensed by the DHW tank temperature sensor, the boiler will go into DHW mode. When DHW is satisfied, or after one hour, the boiler will return to space heating mode.

## 2.9 System 9: Greenstar Heating Boiler in a single zone system with solar thermal DHW and boiler backup

### Summary:

Single boiler with primary/secondary piping configuration supplying one heating zone. Outdoor reset with FW200 controller with built-in room sensor mounted in the living space for room feedback.

Use this design where System 4 cannot be used due to too great a system pressure drop. Primary/secondary piping is also required for radiant floor and panel radiator applications.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

Solar thermal provides renewable energy to heat DHW year round, and if sized properly reduce energy consumption significantly. Bosch offers plug and play components that are designed to work together with a boiler backup system. Bosch solar thermal systems are qualified for government and utility incentives reducing the upfront investment cost significantly. Bosch solar thermal collectors work even in the winter and under cloudy skies preheating water, and reducing boiler run time and burner starts.

### In detail:

The FW200 is an outdoor temperature based controller with room temperature influence. The controller adjusts the heating curve (boiler supply temperature) according to outdoor temperature. When the FW200 is wall mounted as a room sensor, it uses room temperature to adjust the heating curve and modify boiler supply temperature accordingly.

FW200 provides warm weather shutdown.

The control of the solar thermal system is integrated with the FW200 boiler control, and reduces boiler run time and burner starts significantly compared to independent systems. The solar pump will run whenever the collectors are 16°F (9°C) warmer than the bottom of the solar tank.

For temperature sensitive radiant floor applications install a thermostatic tempering valve for overheat protection.

### Required components:

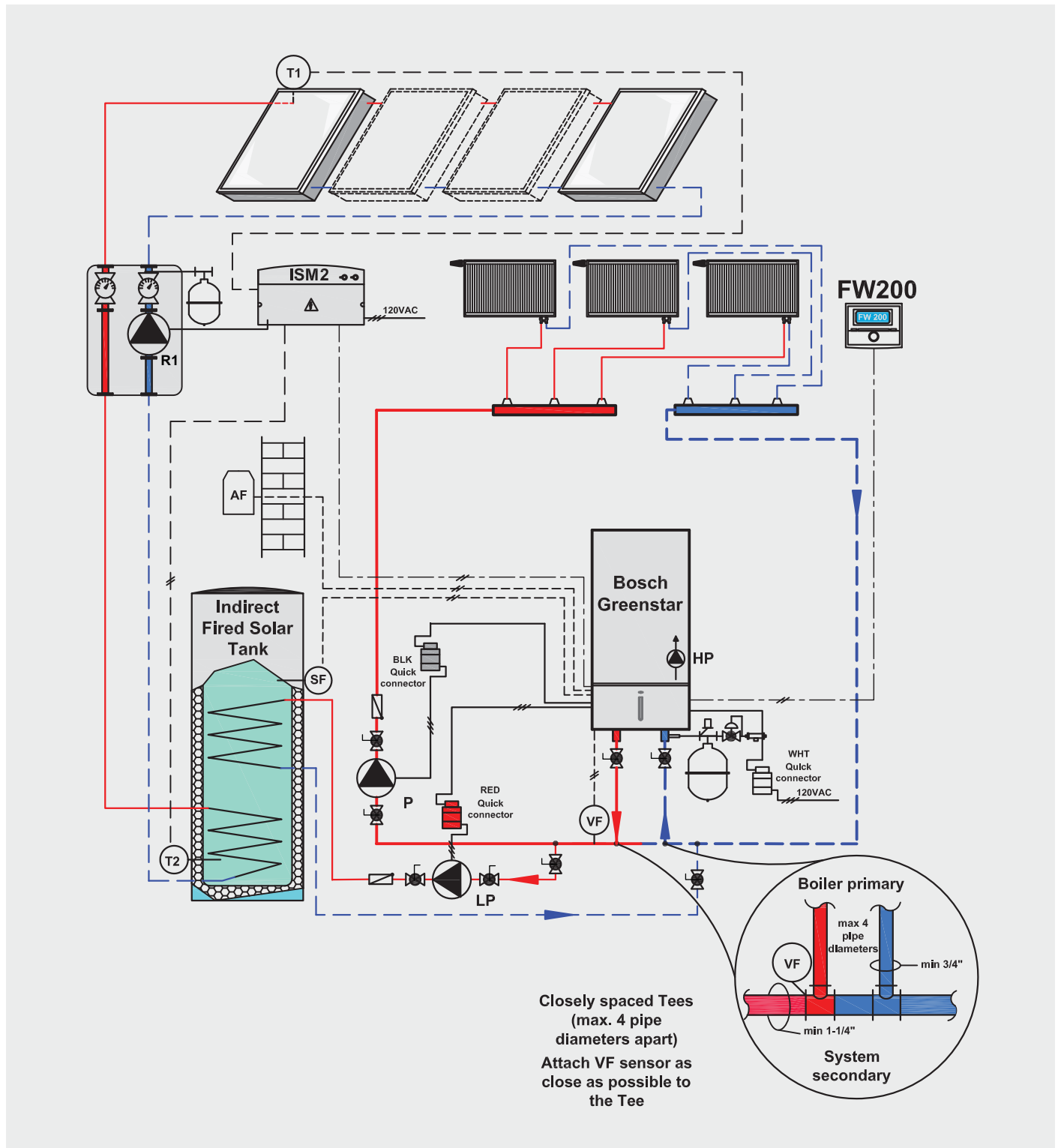
- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the room.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ ISM2.
- ▶ DHW solar tank with 2 coils.
- ▶ Bosch solar thermal system complete.
- ▶ Tank loading pump of sufficient capacity.

### Additional instructions:

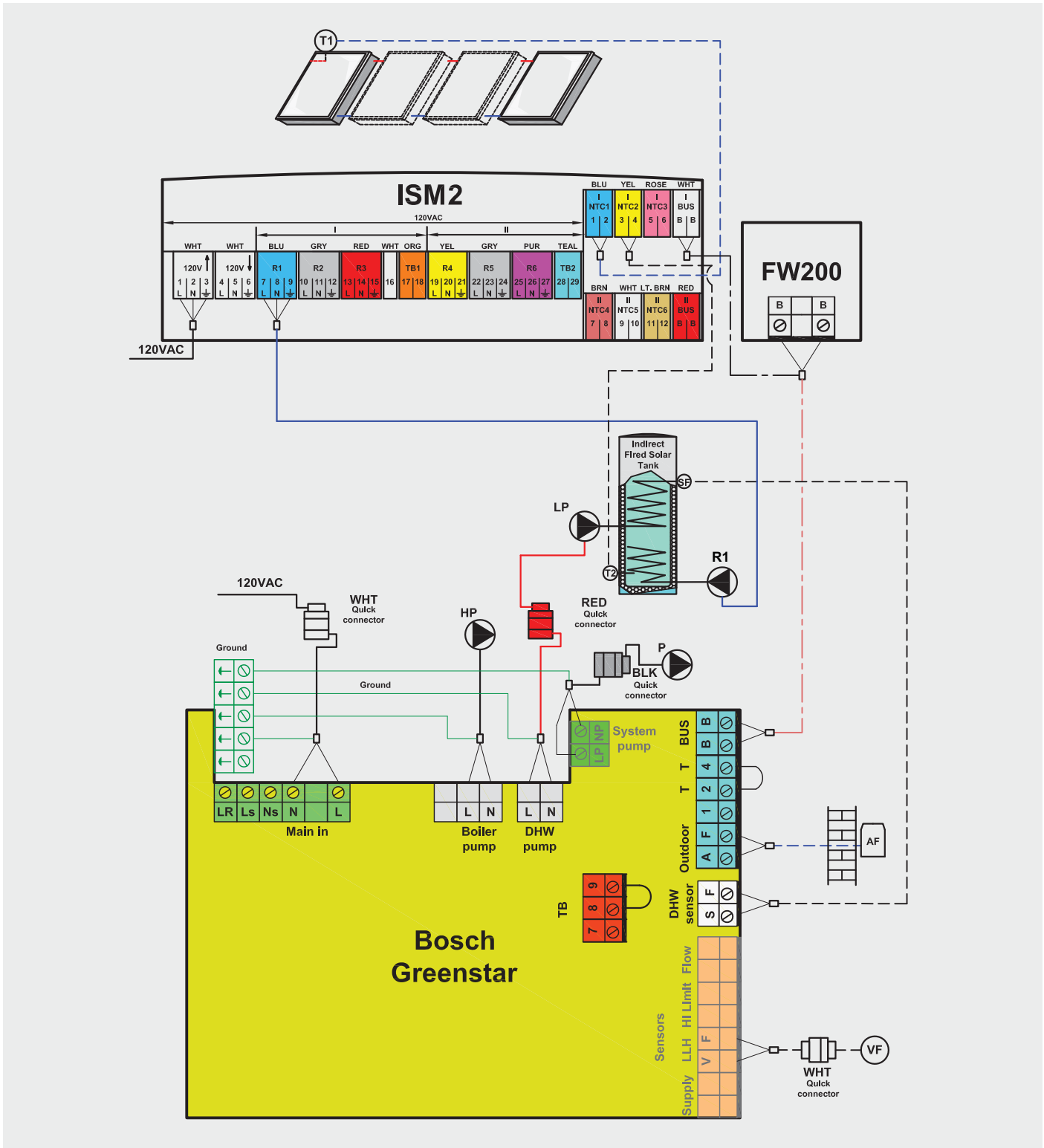
See manufacturer's installation and operating instructions.

The Bosch Greenstar boiler and ISM2 offer many different solar thermal applications including space heating support and pool heating. Please consult the installation and operating instructions for details.

System 9 - Piping diagram



System 9 - Wiring diagram



### System 9: Setup and Programming

In this single zone system the FW200 is installed in the living space in a location that represents the conditions of the entire zone. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to over compensation.

#### Initial setup:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ Use the FW200 for programming the heating system.
- ▶ When commissioning for the first time set the display language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set up the weekly heating program for the three available temperature levels:
  - Comfort ☀
  - Economy (C)
  - Frost (Frost protection) ❄
- ▶ Take advantage of using one of the preset programs from the list or enter a custom program.
  - Program A
  - Program F
  - AM weekday worker
  - PM weekday worker
  - All day
  - All day, lunch
  - Family
  - All day, early shift
  - All day, late shift
  - Seniors
- ▶ Set the room temperatures for the three specified temperature levels.

- ▶ Set up the weekly program for DHW tank loading and the DHW recirculation pump (if installed). Separate individual programs can be set up or the hours of operation can be linked to the heating program.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
- ▶ Proceed in the installer menu to configure the solar thermal system. (The solar system requires manual configuration).
  - Run solar system: Yes
  - Solar system parameters: Standard system.
  - Set options A2 to E as required.
  - It is recommended to keep the factory default solar sys parameters.
- ▶ Exit the installer menu.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

The solar thermal system will start harvesting energy once the collector temperature is at least 16°F (9°C) warmer than the bottom of the solar tank. The upper half of the solar tank ("comfort zone") is maintained at temperature by the boiler during DHW day mode as set in the DHW programming. The lower half is available for solar harvesting.

With outdoor reset the boiler will provide the water temperature according to the heating curve adjusted by the level of room influence (if enabled).

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump.
- ▶ The boiler and the pump will start again when the supply water temperature drops 18°F (10°C) below the set point.
- ▶ When the demand for hot water is sensed by the flow sensor, the boiler will change to DHW mode. When the DHW demand ends, the boiler will return to heating mode.



## 2.10 System 10: Greenstar Heating Boiler with zone pumps and room thermostats

### Summary:

Single boiler with primary/secondary piping configuration supplying multiple heating zones. Outdoor reset with FW200 controller mounted on the boiler. 3rd party room thermostats are used to communicate zone heat demands.

This system is identical to System 8 expanded to multiple zones. The zone circulators run only when a heat demand is communicated by the room thermostat and shut off when the heat demand goes away.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

This system works particularly well for installations with other heat sources, e.g. wood stoves or significant solar gain. Compared to systems with the FW200 installed in the room that will throttle down the boiler output when the room reaches its set point, in this setup the thermostat will shut the boiler off.

This system can also be used with a combi boiler (see system 6) instead of the indirect fired DHW tank.

### In detail:

This system runs on pure outdoor reset without room feedback on the heating curve. The FW200 installed in the boiler adjusts the heating curve (boiler supply temperature) according to outdoor temperature. The 3rd party room thermostats turn the boiler on and off based on the conditions in the living space.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications install a thermostatic tempering valve for overheat protection.

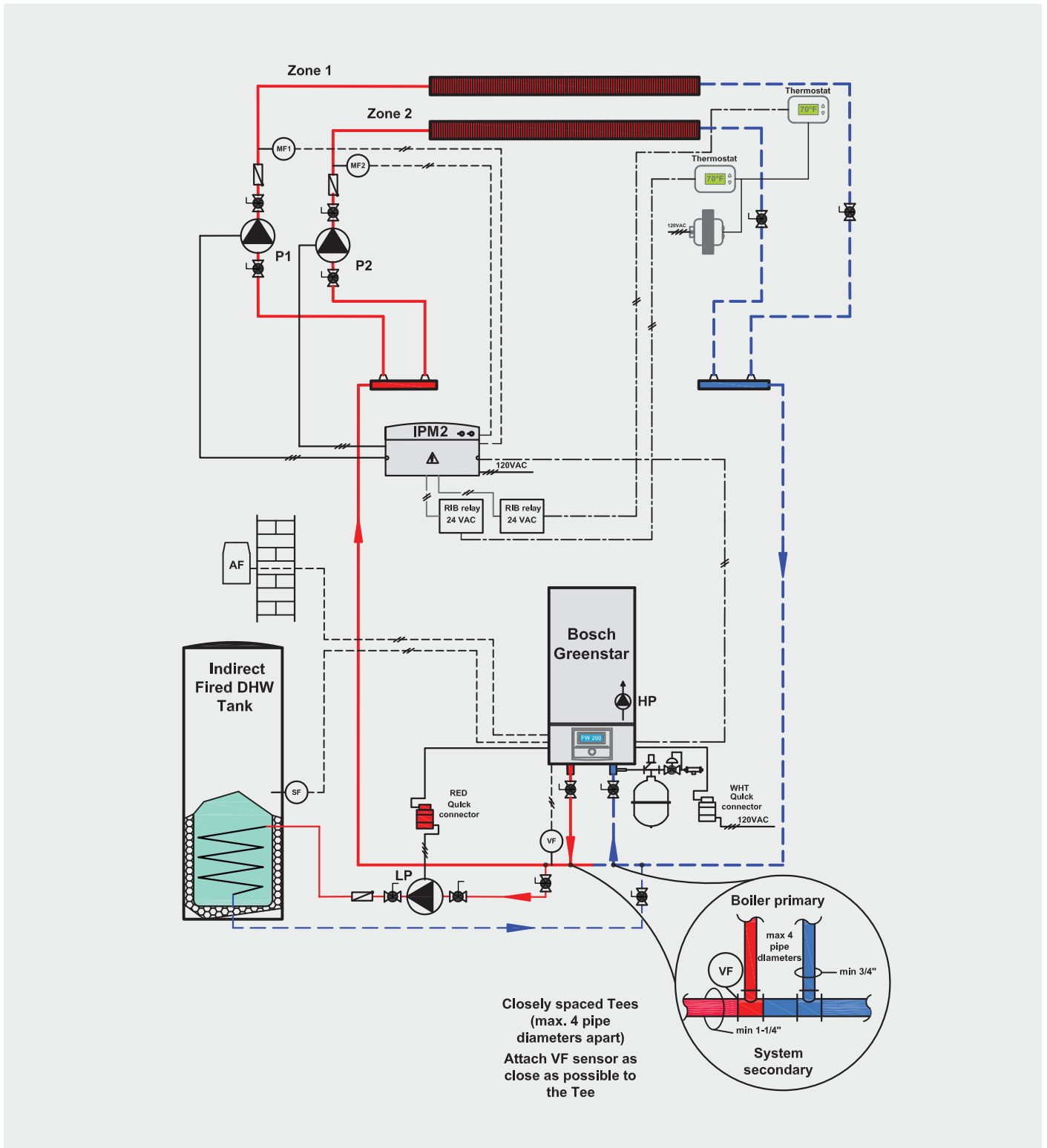
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the boiler.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ 3rd party room thermostats with dry contact closure in each zone.
- ▶ Indirect Fired DHW Tank.
- ▶ Tank loading pump of sufficient capacity.

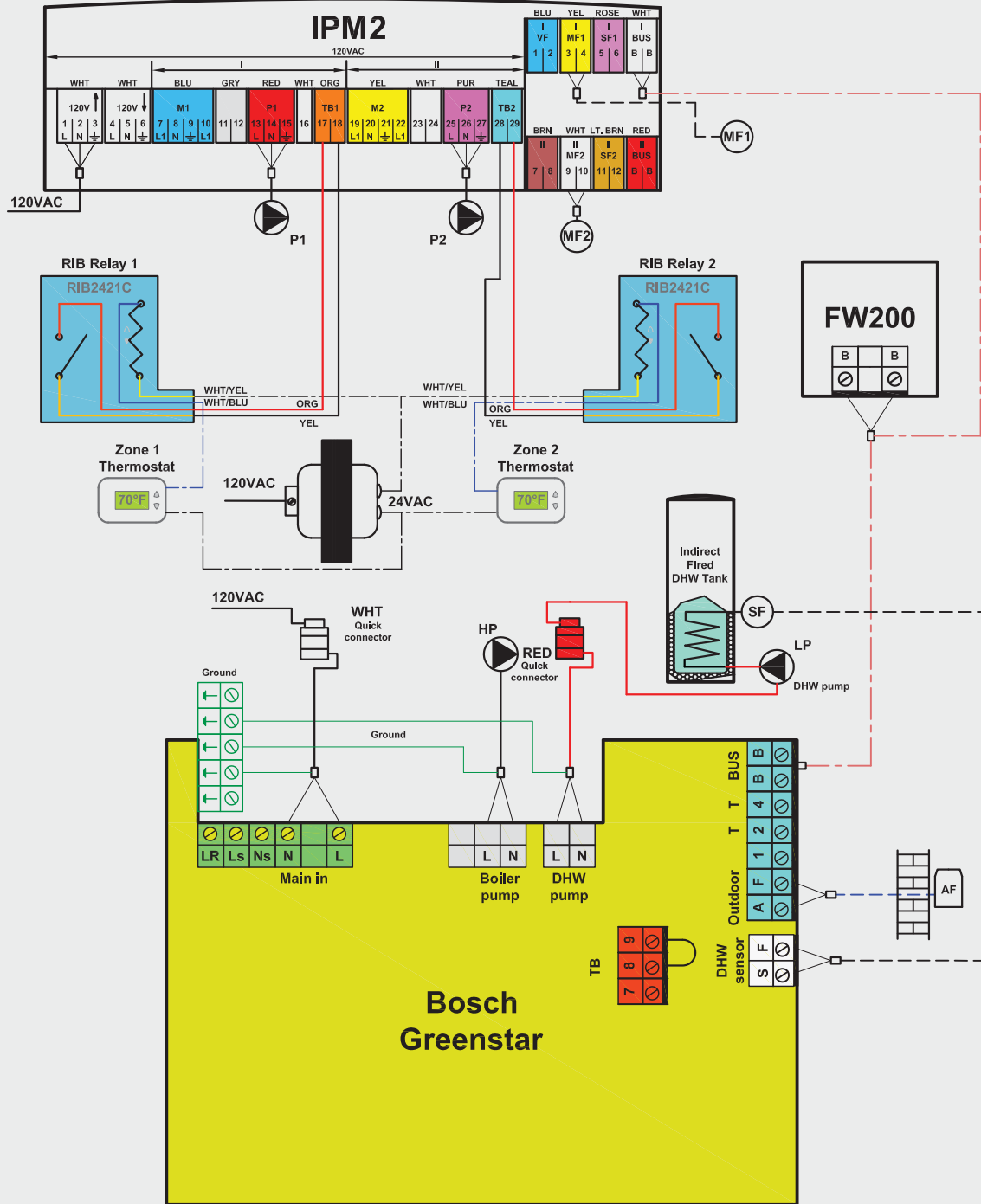
### Additional instructions:

See manufacturer's installation and operating instructions.

System 10 - Piping diagram



System 10 - Wiring diagram



### System 10: Setup and Programming

In this dual zone system the FW200 is installed in the boiler for pure outdoor reset without room influence on the heating curve.

Install suitable 3rd party thermostats in each zone in a location that best represents its conditions. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to malfunctioning.

DHW is generated by the boiler loading the indirect fired DHW tank following the DHW program.

#### Initial setup:

Program the 3rd party room thermostats according to the manufacturer's instructions. It is recommended to set up a day and night heating program with reduced temperatures at night and when the zone is unoccupied.

#### Boiler and FW200 programming:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display-language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set the boiler for permanent day mode by switching the dial on the FW200 to
  - Comfort ☀
- ▶ Set the room temperatures for the three specified temperature levels.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve. There is no room influence on the heating curve in this system.

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump unless the 3rd party room thermostat is satisfied prior.
- ▶ During DHW day mode the boiler will charge the DHW tank when a demand is sensed by the DHW tank temperature sensor. When DHW is satisfied, or after one hour, the boiler will return to space heating mode.

## 2.11 System 11: Greenstar Heating Boiler with zone pumps, relay panel, room thermostats and DHW tank loading

### Summary:

Single boiler with primary/secondary piping configuration supplying three heating zones controlled by individual zone thermostats and a pump relay panel. Outdoor reset with FW200 controller mounted on the boiler. 3rd party room thermostats used to communicate heat demands from the zones.

This system does not feature constant circulation and the zone circulators runs only when a heat demand is communicated by the room thermostat and shut off when the heat demand goes away. It is similar to Systems 8 and 10 except that a pump relay panel is being used.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

This system works particularly well for installations with other heat sources, e.g. wood stoves or significant solar gain. Compared to systems with the FW200 installed in the room that will throttle down the boiler output when the room reaches its set point, in this setup the thermostat will shut the boiler off.

This system can also be used with a combi boiler (see system 6) instead of the indirect fired DHW tank.

### In detail:

This system runs on pure outdoor reset without room feedback on the heating curve. The FW200 installed in the boiler adjusts the heating curve (boiler supply temperature) according to outdoor temperature. The 3rd party room thermostats turn the boiler and the zone pumps on and off based on the conditions in the living space.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications install a thermostatic tempering valve for overheat protection.

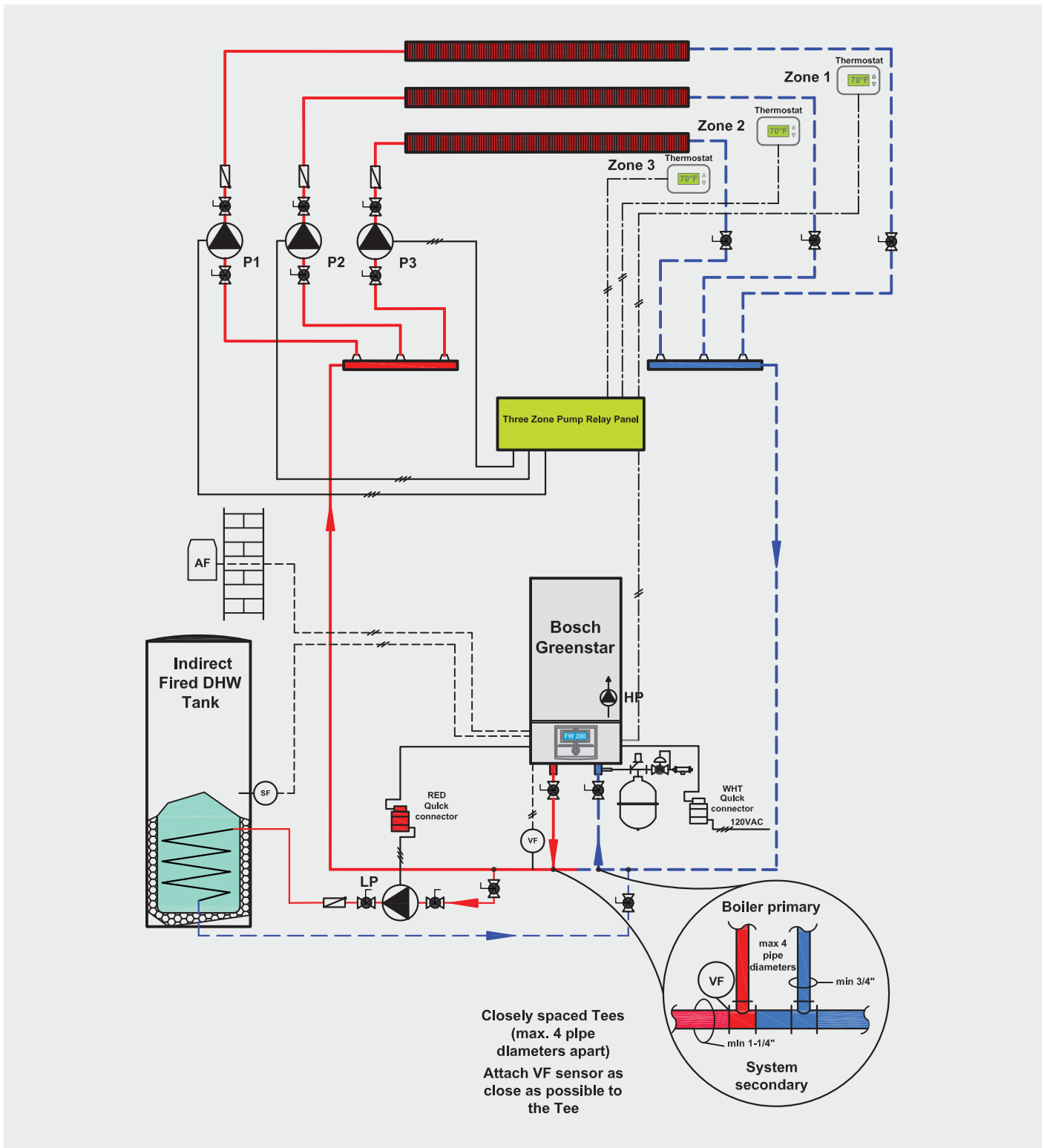
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the boiler.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ 3rd party room thermostats with dry contact closure in each zone.
- ▶ Zone pump relay panel, e.g. TACO SR503 or similar.
- ▶ Indirect fired DHW tank.
- ▶ Tank loading pump of sufficient capacity.

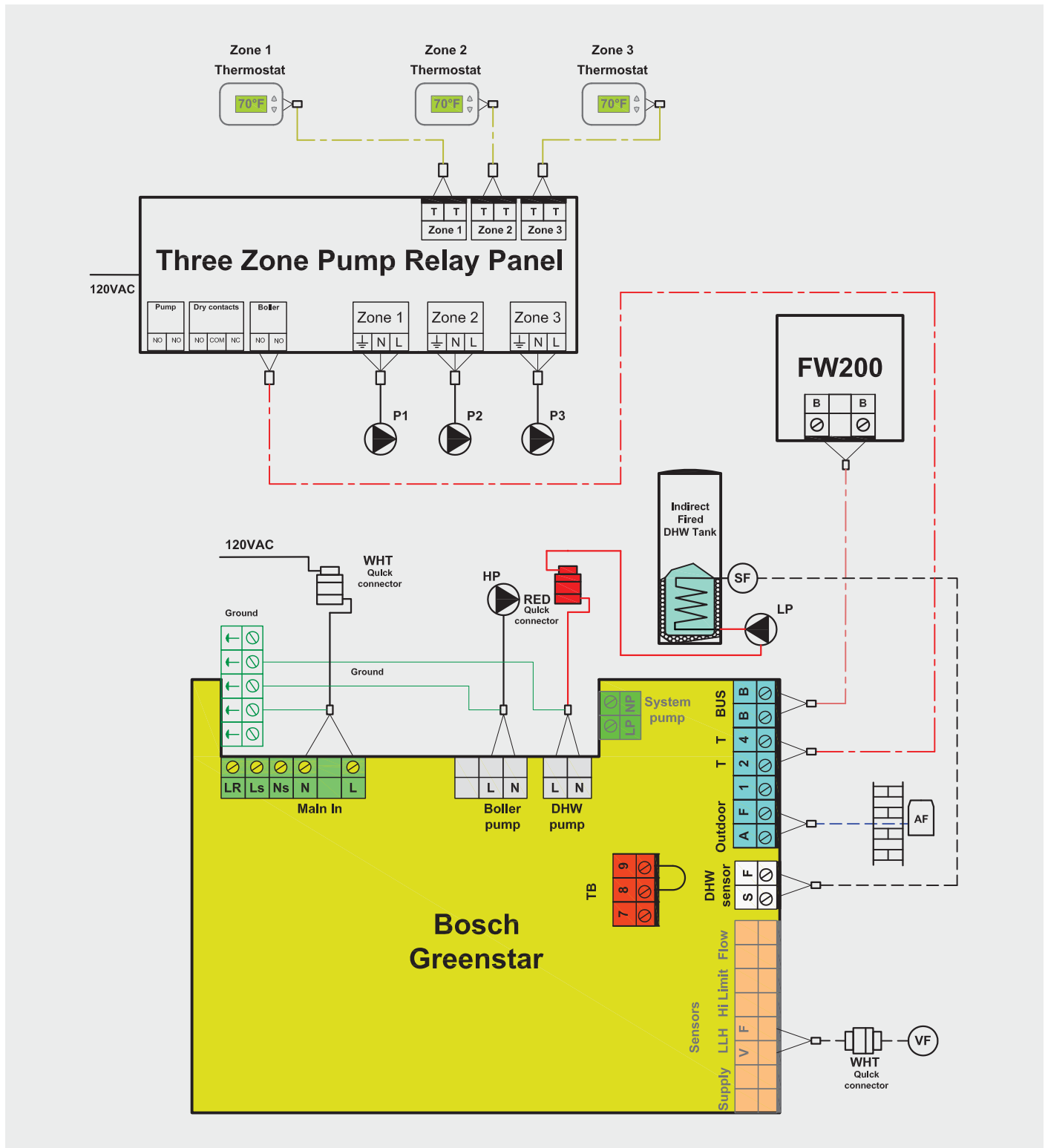
### Additional instructions:

See manufacturer's installation and operating instructions.

System 11 - Piping diagram



System 11 - Wiring diagram



### System 11: Setup and Programming

In this multi zone system the FW200 is installed in the boiler for pure outdoor reset without room influence on the heating curve.

Install suitable 3rd party thermostats in each zone in a location that best represents its conditions. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to malfunctioning.

DHW is generated by the boiler loading the indirect fired DHW tank following the DHW program. This system can also be realized with a combi boiler eliminating the DHW tank if the capacity is sufficient for the DHW load.

#### Initial setup:

Program the 3rd party room thermostats according to the manufacturer's instructions. It is recommended to set up a day and night heating program with reduced temperatures at night and when the zone is unoccupied.

#### Boiler and FW200 programming:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display-language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set the boiler for permanent day mode by switching the dial on the FW200 to
  - Comfort ☀ Set the room temperatures for the three specified temperature levels.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve. There is no room influence on the heating curve in this system.

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump unless the 3rd party room thermostat is satisfied prior.
- ▶ During DHW day mode the boiler will charge the DHW tank when a demand is sensed by the DHW tank temperature sensor. When DHW is satisfied, or after one hour, the boiler will return to space heating mode.



## 2.12 System 12: Greenstar Heating Boiler with zone valves and room thermostats

### Summary:

Single boiler with primary/secondary piping configuration supplying three heating zones controlled by 3rd party room thermostats with zone valves. Outdoor reset with FW200 controller mounted on the boiler.

The zone circulator runs only when a heat demand is communicated by the room thermostats and shut off when the heat demand goes away.

Primary/secondary piping isolates the system flow from the boiler flow and prevents the system from influencing boiler performance.

This setup allows the use of a low energy ECM pump (e.g. Grundfos Alpha) that adjusts the flow rate based on back pressure depending on the number of zones calling. This system works particularly well for installations with other heat sources, e.g. wood stoves or significant solar gain. Compared to systems with the FW200 installed in the room that will throttle down the boiler output when the room reaches its set point, in this setup the thermostat will shut the boiler off.

This system can also be used with a combi boiler (see system 6) instead of the indirect fired DHW tank.

### In detail:

This system runs on pure outdoor reset without room feedback on the heating curve. The FW200 installed in the boiler adjusts the heating curve (boiler supply temperature) according to outdoor temperature.

The 3rd party room thermostats turn the boiler and the zone pump on and off based on the conditions in the living space.

FW200 provides warm weather shutdown.

For temperature sensitive radiant floor applications install a thermostatic tempering valve for overheat protection.

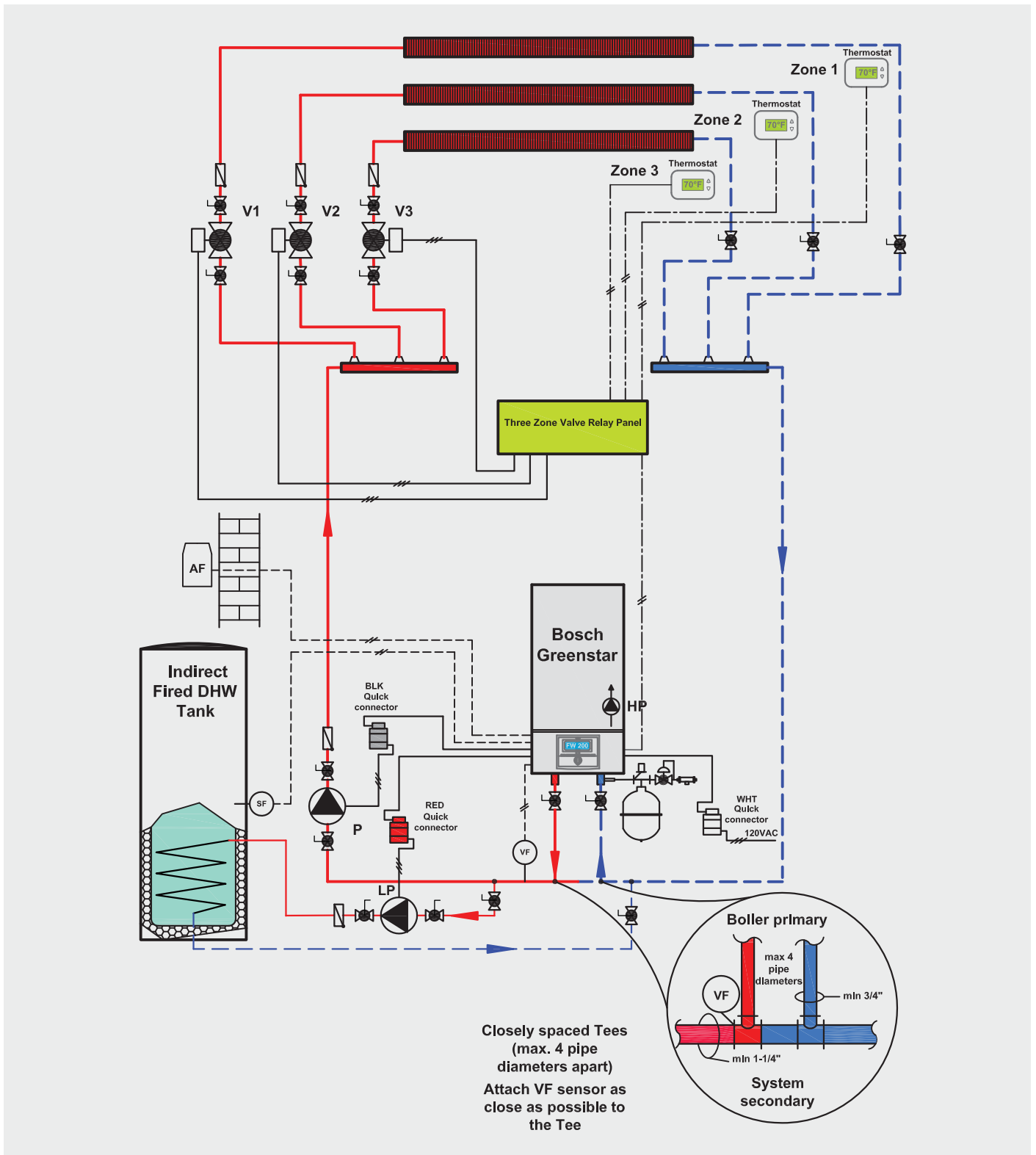
### Required components:

- ▶ Greenstar heating boiler.
- ▶ FW200 controller in the boiler.
- ▶ Primary/secondary piping and system pump.
- ▶ Thermostatic mixing valve (optional - overheat protection for temperature sensitive floors).
- ▶ 3rd party room thermostats with dry contact closure in each zone.
- ▶ Zone valve panel (e.g. TACO ZVC403 or similar).
- ▶ Zone pump (ECM recommended).
- ▶ Indirect fired DHW tank.
- ▶ Tank loading pump of sufficient capacity.

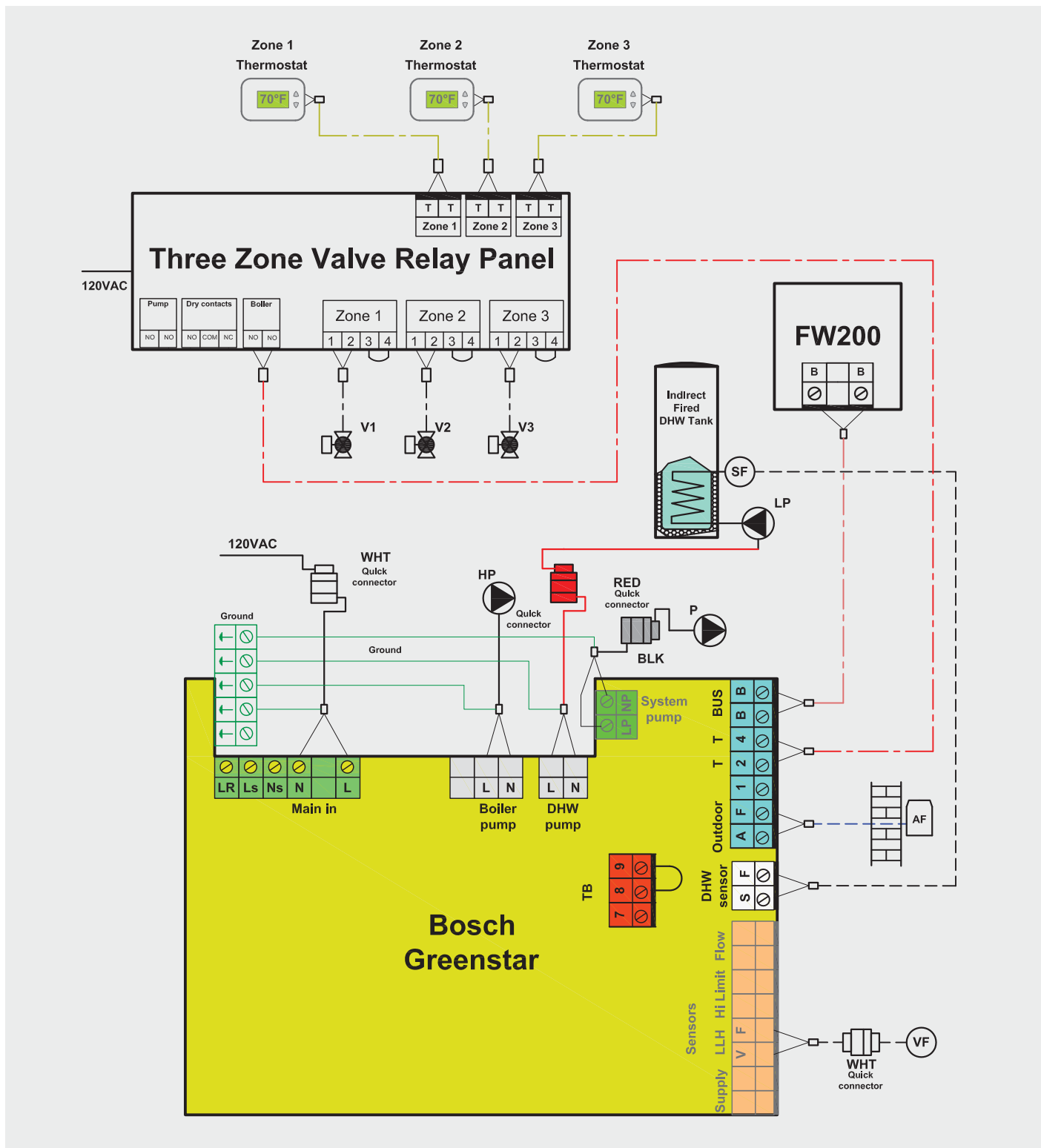
### Additional instructions:

See manufacturer's installation and operating instructions.

System 12 - Piping diagram



System 12 - Wiring diagram



### System 12: Setup and Programming

In this multi zone system the FW200 is installed in the boiler for pure outdoor reset without room influence on the heating curve. Zone control is handled by a zone valve panel with room thermostats in each zone. Use of an ECM pump (e.g. Grundfos Alpha) for a zone pump recommended to reduce energy consumption, risk of noisy pipes, and to establish a constant delta T.

Install suitable 3rd party thermostats in each zone in a location that best represents its conditions. Avoid locations exposed to direct or indirect sunlight, heat sources, draft, etc. that can lead to malfunctioning.

DHW is generated by the boiler loading the indirect fired DHW tank following the DHW program. This system can also be realized with a combi boiler eliminating the DHW tank if the capacity is sufficient for the DHW load.

#### Initial setup:

Program the 3rd party room thermostats according to the manufacturer's instructions. It is recommended to set up a day and night heating program with reduced temperatures at night and when the zone is unoccupied.

#### Boiler and FW200 programming:

See the installation instructions for description of buttons and displays, and for details on setup and programming.

- ▶ Power up the boiler.
- ▶ When commissioning for the first time, set the display-language, date and time.
- ▶ Upon first commissioning the automatic system configuration starts. Wait 60 seconds and follow the instructions displayed. You have the option of using the factory settings or entering custom parameters to better match the individual requirements.
- ▶ Set the boiler for permanent day mode by switching the dial on the FW200 to
  - Comfort ☀
- ▶ Set the room temperatures for the three specified temperature levels.
- ▶ Enter the installer menu to configure the heating zone.
  - Set heating circuit to the type of heat distribution used.
  - Set the minimum outdoor temperature, building storage capacity, design day temperature, and maximum supply temperature.
  - Set the remaining parameters as applicable.
- ▶ Set up the weekly program for DHW generation.
- ▶ When done, ensure the mode selector is set to AUTO.
- ▶ The room temperature will be displayed.

#### Additional information

With outdoor reset the boiler will provide the water temperature according to the heating curve. There is no room influence on the heating curve in this system.

- ▶ The boiler will always attempt to run at its highest efficiency in low fire for as long as necessary.
- ▶ The boiler will shut down when the target temperature is reached followed by a 3 minute post purge by the pump unless the 3rd party room thermostat is satisfied prior.
- ▶ During DHW day mode the boiler will charge the DHW tank when a demand is sensed by the DHW tank temperature sensor. When DHW is satisfied, or after one hour, the boiler will return to space heating mode.







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